ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

JOINT PROGRAM BETWEEN FACULTIES OF INFORMATICS & MEDICINE

DEPARTMENT OF HEALTH INFORMATICS

KNOWLEDGE AND PERCEPTION OF HEALTH CARE PROVIDERS TOWARDS TELEMEDICINE APPLICATIONS & BENEFITS:

A SURVEY FROM TIKUR ANBESSA & NEKEMETE HOSPITALS

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN HEALTH INFORMATICS

By: ALEMAYEHU BISRAT GEBRE

JUNE, 2010

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DEDICATION

THIS WORK IS DEDICATED TO MY WIFE LEMLEM YILMA WHO NEVER HESITATES TO HELP ME THROUGH ALL DIFICULT TIMES.

DECLARATION

The Thesis is my original work, has not been presented for a degree in any other University and that all sources of materials used for the thesis have been acknowledged.

_____

Alemayehu Bisrat Gebre

This thesis has been submitted for examination with my approval as university advisor.

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Dr. Getenet Mitike (Assoc. Prof.)

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Acronyms

AAU	Addis Ababa University
CME	Continuous Medical Education
EICTDA	Ethiopian Information Communication Technology Development Agency
ECA	Economic Commission for Africa
FoM	Faculty of Medicine
ICT	Information Communication Technology
IPLC	International Private Leased Circuit
ISDN	Integrated Services Digital Networks
ITU	International Telecommunication Union
MoH	Ministry of Health
NASA	National Aeronautics and Space Administration
NH	Nekemete Hospital
POTS	Plain Old Telephone Service
TAH	Tikur Anbessa Hospital
TC	Tele Consultation
TCIL	Telecommunication Corporation India Limited
TM	Telemedicine
USA	United States of America
WB	World Bank
WHO	World Health Organization

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ABSTRACT

Background: Ethiopia has an approximate population of 79 million of which more than 84% live in rural areas. The health care system is weak. The country experiences a heavy burden of disease with a growing prevalence of communicable infections. Telemedicine is the delivery of health care and medical knowledge over a distance using telecommunications systems. It is currently being used to bridge the physical distance between patients in remote areas and medical specialists around the world.

Objectives: This survey is designed to assess health care providers perceived knowledge, skill and attitude regarding telemedicine systems, clinical application areas, benefits and assess the current status of the telemedicine centers of Tikur Anbessa and Nekemete Hospitals.

Methods: The study design is both quantitative and qualitative. A Hospital based survey was conducted on April-May 2010 across professional groups using stratified random sampling. A self administered questionnaire distributed to a total of 520 health care providers and four hundred seventy five (91%) of them was returned. An interview and observation methods were also employed. The data collected from the questionnaire is coded, processed and analyzed using SPSS software version 16.0.

Findings: The study revealed that 48.9% of the respondents from Tikur Anbessa and 73.5% of the respondents from Nekemete hospital have very good knowledge of telemedicine systems. Moreover, only 52.6% of the respondents are found aware of telemedicine clinical application areas and 68.8% of them are aware of the benefits of telemedicine. The majority agreed up on resistance to new technology among health care providers, poor culture and underdeveloped telecom infrastructure as major barriers that hinder telemedicine development.

Conclusion and Recommendations: The study disclosed that the majority of the respondents of both hospitals are knowledgeable towards basic telemedicine systems and services. The majority again have favorable attitude towards the technology. On the other hand their awareness to the potential benefits and clinical application areas is found at a lower level. Working to eliminate barriers and wide scale promotion that helps to raise the level of awareness is recommended.

Keywords: Telemedicine; Tele-health; knowledge of Telemedicine; Perception of Telemedicine

CHAPTER ONE

BACKGROUND

1.1 Introduction

Ethiopia is a country gifted with rich and ancient historic background and geographically the nature has provided it with all the varieties like the mountain regions, deserts, lakes & green planes. The country, which is among the low income group today, has more than 79 Million populations and there is finite limit of elasticity in providing health care in terms of infrastructure, facility, the manpower and the funds. Wide disparities persist between different income groups, between rural and urban communities, and between different states and even districts within States (WHO, 2008).

The health care system is weak and according to Ministry of Health (MoH) Health and Health Related Indicators (2008, pp.1) 'the country experiences a heavy burden of disease with a growing prevalence of communicable infection'. High cost of health care and lack of investment for health care in rural areas, inadequate medical facilities, shortage of trained man power and problem of retaining specialists in rural and inaccessible areas worsen the problem of health care delivery (MoH, 2008).

The advances in Medical science, biomedical engineering on one side and Telecommunication and Information Technology on the other side are offering wide opportunities for improved health care delivery. Among these technologies telemedicine is considered a potential solution to fill the gap created by shortage of medical facilities and lack of qualified health professionals and revolutionize the health care system in a cost effective way (Dasgupta, 2008).

Telemedicine is the use of electronic information communication technologies to provide and support healthcare when distance separates the participants (Brown, 1995). "Tele" is a Greek word meaning "distance" and 'Medicine" is a Latin word meaning "to heal". Thus it is called "healing by wire". It is adaptation of telecommunication technology that offers one of the best options for delivering healthcare for rural and geographically distant population. Although

initially considered futuristic and experimental, telemedicine is today a reality and has come to stay. It has a variety of applications in patient care, education, research, administration and public health (Ganapathy, 2001). Worldwide, people living in rural and remote areas struggle to access timely, good-quality specialty medical care. Residents of these areas often have substandard access to specialty healthcare, primarily because specialist physicians are more likely to be located in areas of concentrated urban population. Telemedicine has the potential to bridge this distance and facilitate healthcare in these remote areas (Dagupta, 2008).

Introducing telemedicine to Ethiopia is assumed to be a cost effective means to improve delivery of health care to the rural areas. It also helps to educate the public on prevention methods. But, it requires efforts in creating awareness among health care providers and working hard on building up of telecommunication infrastructure to underserved regions (Abebe, 2007). Some attempts to introduce telemedicine through the initiative of the Ethiopian Telecommunication Corporation (ETC), Ministry of Health (MoH), Addis Ababa University Faculty of Medicine, with support from International Telecommunication Union (ITU), World Health Organization (WHO), United Nations Economic Commission for Africa (UNECA), and United Nations Educational Scientific and Cultural Organization (UNESCO) have demonstrated the application of this technology in extending improved health care service to the people (Abebe, 2007).

This study which is focused on assessing the knowledge and perception of health care providers towards telemedicine technology, applications and benefits based its survey on Tikur Anbessa and Nekemete Hospitals (NH). Tikur Anbessa Hospital is the largest teaching and referral Hospital in the country. It was established in memory of Prince Mekonnen, Duke of Harar, the son of His Imperial Majesty Haile Silassie and Inaugurated by the name Prince Mekonnen the Duke of Harar Memorial Hospital in 1973 (AAU Medical Faculty, 2008).

At establishment its major objective was providing senior medical service with an attempt to make it a place where the Ethiopian physicians should be trained and be a place where various research and studies shall take place (AAU Medical Faculty, 2008). It received the Name Tikur Anbessa Hospital by 1975. The fund for the building was contributed by the people of Ethiopia, budget allotted by the government and donations from some foreign countries. During

establishment it was believed that it was the biggest and an exemplary hospital in Africa with the capacity of 500 beds.

Currently the hospital holds 850 beds. Its annual budget reached 38,375,900.00 ETB for the year 2007. The total number of employees is 1234, and among them 540 are health care professionals and the remaining 694 are administrative employees working full time in the hospital. The major operations provided were provision of medical services; providing training in the profession of medicine; and conducting research activity in the field (AAU Medical Faculty, 2008).

Table 1.1: TAH Staffs by Professional Category and Qualification for the Year 2002 EC.

Title	PHD	MSC	BSC	Diploma	Total
Anesthetist	-	-	13	-	13
GP	-	-	8	-	8
Lab. technologist	1	2	31	7	41
Midwives	-	-	13	-	13
Nurse	-	3	118	276	397*
Pharmacists	-	-	7	11	18
Physiotherapist	-	1	22	-	23
Radiographers	-	-	13	5	18
Specialist Dr.	-	9	-	-	9
Total Clinical Staff					**540**

***107 Nurses were employed on a contractual basis**

Nekemete Hospital was founded in the town of Nekemete, which is about 331 Km. south west of Addis Ababa. It was established by the Swedish mission in the year 1932. The hospital is a zonal hospital and provides medical service to the residence of the town and patients in the surrounding. The hospital currently has about 178 beds and clinical staffs serving the hospital full time has reached 120. Services provided by the hospital includes out-patient services; major and minor operations; in-patient services; maternal and child health services; HIV/AIDS services; laboratory, x-ray & ultrasound services; drug and pharmaceutical service; and training

services. During the current fiscal year the budget has reached 7,034,223.00 ETB. Though it has its governing board, the hospital is administered under the Oromia Regional Health Bureau.

Table 1.2: Nekemete Hospital Staffs by Professional Category and Qualification for the Year 2002 EC.

Title	PHD	MSC	BSC	Diploma	Total
Dental Therapist	-	-	1	-	1
GP	-	-	7	-	7
Health Officer	-	-	9	-	9
Lab. technologist	-	-	2	6	8
Nurse	-	-	4	76	80
Pharmacists	-	-	2	5	7
Physiotherapist	-	-	1	-	1
Radiographers	-	-	1	1	2
Specialist Dr.	-	5	-	-	5
Total Clinical Staff					**120**

1.2 Statement of the Problem

Ethiopia's health care system is among the least developed and the country experiences a heavy burden of disease with a growing prevalence of communicable infections. There are 88 Hospitals, 721 Health Centers and 11,446 health posts run by the Ministry of Health. A doctor to population ratio is one of the lowest in the world i.e. 1:37,996; Health officers to population ratio is 1:63,785; Nurses to population ratio is 1:4,725; and Health extension workers to population ratio is 1:3,224 (MOH, 2008).

According to the MOH Health and Health Related Indicators (2008, pp1) many Ethiopians face high disease morbidity and mortality largely attributable to potentially preventable infectious diseases and nutritional deficiencies. Widespread poverty, poor nutritional status, low education levels and poor access to health services have contributed to the high burden of ill health in the country. The document further indicated some efforts made by concerned bodies. Among these were government concerns to the sector.

The government, in response to the health problems, has developed a 20 year rolling Health Sector Development Program. Important steps have been taken in the decentralization of the health care system; a four-tire health system and a national HMIS and M&E reform have been developed. This has resulted in an increase in health care coverage. The overall potential health service coverage in 2000 EFY was estimated at 89.6%, that showed 25.6% increase from 1996 (MoH Fact Sheet, 2009). Although this is an encouraging effort, it will take a number of years to see a noticeable improvement in the health problem of the country.

Introducing telemedicine which is the use of telecommunication and information technologies to exchange health information and provide health care services across geographic, time, social and cultural barriers is considered a potential solution to alleviate the current health care problem and revolutionize the health care system in a cost effective way (Dasgupta, 2008). It allows medical personnel at the underserved areas to get specialist support from hospitals in the cities. By doing so, telemedicine can address two of the problems facing the health care system of the country: inadequate access and uneven resource distribution. This is particularly important in rural areas that lack the means to get access to proper health care and unable to employ medical personnel.

It is also important in the cities as a means to get access to advanced health care systems and specialist support from physicians living abroad (Hein, 2009).

However, the diffusion of telemedicine and its application will ultimately depend on the knowledge and perception on its application and benefits and its acceptance among the end users particularly- health care practitioners (Banjoko, 2008). Recently some telemedicine initiatives were started to implement and the country were investing on expensive high-tech equipments and manpower. But, preliminary studies and observations revealed low level of utilization and achievements compared to the expected potentials of the system. What factors hinders its development? What is end users especially health care providers' level of knowledge with regard to telemedicine system and service? What is their level of awareness towards benefits and application areas of telemedicine? How do they perceive this technology?

This study is thus designed to answer such and other questions by assessing the knowledge and perception of health care providers in Tikur Anbessa and Nekemete Hospitals towards telemedicine applications and benefits in particular and to assess the current status of the telemedicine units of the two hospitals.

1.3 Rationale of the Study

The following rationales underscore the research significance:

- The recent ICT development in general and telemedicine initiatives in particular are encouraging
- The issue of health care is essential for Ethiopia as the country experiences heavy burden of disease
- There is shortage of trained health professionals and health facilities

1.4 Scope of the Study

The scope of this study is limited to assessing the knowledge level and perception of health care providers working in Tikur Anbessa and Nekemete Hospitals towards telemedicine systems, applications and benefits through a survey questionnaire. Furthermore, the current status of the telemedicine units of the two hospitals is assessed from data obtained through an interview, personal observation and reviewing documents and reports of the centers. Dealing with technological details, evaluative assessment of the centers activities, cost effectiveness, networking, software issues and the like are beyond the scope of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Information Communication Technology (ICT) in the Health Sector

Several countries have not been achieved the basic circumstances for health, though considerable improvement in health has been made over the last half of a century. Health problems for which solutions are well-known as well as avoidance is feasible are causes for the majority of the burden of premature death and disease among the deprived. One research found out that the health of populations in underdeveloped countries is still remain in danger and the gap in health service among the well-to-do and the unfortunate, keeps on rising (Dzenowagis, 2005).

The researcher again revealed, less developed countries features a high burden of 'endemic and epidemic' prone transmittable diseases, inappropriately high levels of child and maternal mortality, a continuing HIV/AIDS plague and the fast increase of chronic situations speed up by poverty. In various countries, there is extended limitation in access to primary health services, associated to a lack of trained health care providers. In spite of these and many additional problems, various countries are trying to make and maintain their health infrastructure (Dzenowagis, 2005).

Desire to build up and systematize latest techniques of delivering health services have gone together with major advances in Information Communication Technologies (ICTs) especially during the last decade. This allows improved support for health services and schemes, and improving worldwide understanding of health problems. ICTs as defined by Chetley, (2006) are tools that facilitate communication and the processing and transmission of information and the sharing of knowledge by electronic means. Furthermore, the author elaborated that the term covers the complete variety of electronic digital and analog ICTs, from radio and television to telephones, computers, electronic-based media such as digital text and audio-video recording, and the Internet, but excludes the non-electronic technologies (Chetley, 2006). These equipments embrace vast assurance for the health sector in both developed and

developing countries and a number of countries are recognizing the benefits these days (Horsch, 2003).

A research made by World Information Technology and Services Alliance (WITSA) identified that nearly all countries of the world are on the process of health sector restructuring to attempt to give extended and impartial access to better services whereas dropping or as a minimum controlling the increasing cost of health care. These restructuring processes clearly have numerous parts and there is no distinct model being implemented by all countries, but, ICTs have the possibility to formulate most important input to improving access and excellence of services while controlling costs. Improving 'public health and medical programs' which is intended to give optional, emergency situation and continuing medical care, alerting people, developing nourishment and sanitation, and presenting new clean living conditions consequently brings advancement in people's health status. As many health problems depart well outside the health sector, these all eventually entail huge societal and economic changes (WITSA, 2006).

The same study indicated that the health sector has constantly relied on technologies. Accordingly, technologies shape the strength of the services 'to prevent, diagnose and treat illness and disease'. Information Communication Technologies are simply single group of the enormous collection of technologies that possibly applied. These technologies are capable of dominant tools for those trying to advance health if and only if supported with best guidelines, coordination, resource and institutions (WITSA, 2006).

Ways of communication that the public utilize to converse among each other have too transformed considerably. This issue further elaborated in the literature as follows: "Mobile telephony, electronic mail and videoconferencing offer new options for sharing perspectives. Digital technologies are making visual images and the voices of people more accessible through radio, TV, video, portable disk, players and the Internet, that change the opportunities for people to share opinions, experiences and knowledge" (WITSA, 2006).

Besides controlling expenses, information technologies offer health workers as well as the system as a whole the chance to improve patient care by reorganizing clinical procedures and generating correct courses of recording and keeping patient information. Health workers make use of paper-based records to record a patient's history of health care services'. Unfortunately, utilizing these methods directs to insufficient documentation of the care-giving procedure and a significant interruption in the provision of health care services. Information technologies have really changing these conditions. For instance, computer-based patient/medical records, handy computers, and expert information systems exhibit their support by means of presenting clinicians with immediate contact to patient information at the point of care provision (WITSA, 2006).

They have the capacity to reorganize the health system record gathering approach from a "collect many times, use once" system to that of a "collect once, use many times" arrangement. With regard to this the leading technological developments that assist health care organizations in achieving their objectives are summarized as Computer-based Patient Records, Data Warehousing, Document Imaging, Internet Solutions, Expert Information Systems and Telemedicine (WITSA, 2006).

Furthermore, another study explored the task that ICT can play in the sector. According to that study, the use of ICTs in health is not purely about technology but it can be a way to achieve a series of aspired results such as health workers making better treatment decisions; hospitals providing higher quality and safer care; people making informed choices about their own health; policy makers and the public aware of health risks; and people having better access to the information and knowledge they need for better health (Chetley, 2006).

2.2 Telemedicine and its Contribution to Health & Society

Literally, Telemedicine means medicine at a distance. Though the concept has been described in many ways and in different perspectives, there is however a universally accepted definition. For instance, Dasgupta (2008) express the term as the delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities. (Dasgupta, 2008; Edirippulige, 2007).

Another, definition offered by Bauer and Ringel (1999) describes it as the combined use of telecommunications and computer technologies to improve the efficiency and effectiveness of health care service by liberating care givers from traditional constraints of place and time and by empowering consumers to make informed choices in a competitive marketplace.

Telemedicine has been in operation in some form for over thirty years, whereas the outburst of importance in telemedicine over the past ten years makes it emerged as a rather new use of telecommunication technology. The National Aeronautics and Space Administration (NASA) take part in early development of telemedicine (Bashshur, 1980). It was reported that NASA's efforts in telemedicine commenced in the beginning of 1960s when human beings began flying in space. At that time the purpose was to pass on physiological monitoring from both the 'spacecraft and the space suits' for the period of the operations (Dasgupta, 2008).

In 1967, a different case for tele-consultation that has been reported was a linking of television connecting "Massachusetts General Hospital and Logan International Airport Medical Station" (Singh, 2006). Another telemedicine project that was run for four years covering the period 1972-1975 and imagined by the NASA was the 'Space Technology Applied to Rural Papago Advanced Health Care that delivered medical care to the Papago Indian Reservation in Arizona'. Its aims were to give healthcare to astronauts in space and to supply all-purpose medical care to the Papago reservation (Dasgupta, 2008). The National Library of Medicine's Lister Hill National Center for Biomedical Communication selected 26

sites in Alaska in 1971 to observe if consistent communication would advance rural communities healthcare. As it was stated out it was using a technology called “ATS-1, the first in NASA’s series of Applied Technology Satellites” (Dasgupta, 2008). The major focus point was to study the application of satellite video discussion to improve the value of rural health care in Alaska. In another study it was reported that since 1977, the Telemedicine center that was established at the Memorial University of Newfoundland has attempted to some extent in the direction of extending ‘interactive audio networks for educational programs and the transmission of medical data” (Dasgupta, 2008).

In Australia, The North-West Telemedicine Project was set up in 1984, with the objective of pilot-testing a ‘government satellite communication network’. Health care provision to people in five isolated towns south of the Gulf of Carpentaria was its main purpose.

The first international Telemedicine Program was conducted by NASA in 1989. By the support of the US/USSR Joint Working Group on Space Biology, telemedicine discussions were accomplished using one way video, voice and facsimile technologies among a medical center found in Yerevan, Armenia and medical centers in USA (Dasgupta, 2008). Nevertheless, with the extensive application of the Internet, cell phones, wireless technologies, etc. the majority of the expansion’s started during the period of late 1980’s and early 1990’s (American Telemedicine Association, 2006).

Various literatures have indicated that organizations in the health service are under growing demands from societal challenges, especially because of the problems such as “changing demographics combined with rising occurrence of chronic diseases; shortages in human resources in healthcare; and increased demands from patients for more quality healthcare provision services”. Contained with this challenging environment, healthcare costs are rising quickly, creating basic inquiry on how to attain sustainable and impartial healthcare systems (European Economic & Social Committee, 2008).

As described by Ojo, (2006) that, telemedicine and modern Information and Communication Technologies if merged by way of appropriate organization, management and expertise, be able to assist in dealing with various societal problems to the health systems. The advantages

vary over diverse points, from single patients, all the way through healthcare systems entirely.

At individual level, telemedicine be capable of supporting progress in 'a patient's health and quality of life', mainly in favor of persons with chronic diseases, allowing secure checking at their residence. Furthermore, this technology truly has the potential of decreasing the amount of visits of the patient to the hospital. It was also mentioned that telemedicine was used as a way to teach patients successfully on how to deal with their illness and treatment, to obtain medical advice when required and finally to observe their health situation by themselves in a safe way. Furthermore telemedicine can made possible that patients would stay in their known location and society arrangements, hence reducing the suffering from separation for treatment purposes (European Economic & Social Committee, 2008).

Shortage of health professionals, particularly in remote areas would also be addressed by applying telemedicine technology and can recover the competence, quality and timeliness of service provision. This is the benefit that the healthcare systems can possibly achieve. (European Economic & Social Committee, 2008).

Finally, employing telemedicine likely add to the development of the economy. Maintaining telemedicine technology would help e-health market expansion in general, since telemedicine services can be linked to many additional services for instance "electronic health records and personal health systems" (European Economic and Social Committee, 2008).

Dasgupta (2008) demonstrated that telemedicine is developing into one of the merging services in information technology and a cost effective medium in clinical practice. The research further pointed out that patients greatly assisted by the skill of the health professionals plus their services be spread in health education programs to students who undertake short term training and further education in health.

Despite the above facts, implementation of telemedicine has faced a lot of barriers in different countries. Among these barriers, literatures identified that organizational barriers that include uncommitted leaders or lack of support from executive management team, and lack of accessibility to the facilities that have the equipment, unclear division of responsibility among

the profession, lack of educated IT staff, mental barriers, unwillingness to change, technical barriers such as infrastructural problems, privacy and confidentiality issues are the major ones (ITHS, 2000).

2.3 Types of Telemedicine Services and Technology Options

According to various literatures, telemedicine applications are performed on the foundation of three different kinds of services. These services are classified as Immediate or Real Time or Interactive; Store-and-Forward; and Remote Monitoring method (Singh, 2006; Dasgupta, 2008).

Brief explanations provided in the literature for the first type of service which is an Immediate or Real Time Telemedicine is that it is a two way interactive television. It is also named as Synchronous method. It is a method used when a face-to-face consultation or discussion is necessary (Dasgupta, 2008). Through interactive telemedicine, real time activities that range from physical examinations to psychiatric evaluations can be carried out. Even surgeries can be undertaken with the guidance of specialists from a remote location who assist on-site staff via video conferencing.

Using interactive technology health workers or patients at remote or distant locations can communicate among each other by means of 'communication technology in the form of audiovisual and wireless or microwave signals' (Singh, 2006). Without video conferencing, secondary sensing apparatus also is connected to the patient or the equipment to aid in interactive examination. For instance, tele-stethoscope is used to examine heartbeat or tele-otoscope to inspect an ear. Real-time method of delivery is frequently used for specialties such as psychiatry, internal medicine, cardiology and pediatrics (Brown, 1996; Singh, 2006; Dasgupta, 2008).

The Store and Forward method is not a live technology. It is also named as asynchronous method. It engages obtaining patient images and bio-signals, storing and sending out this information to a specialist for discussion and assessment. This method does not necessitate

immediate contact among both parties in real time. It is typically used for non-emergent situations, when a diagnosis or consultation may be made in the next 24-48 hours and sent back (Singh, 2006).

Store and forward mechanism is provided appropriately for specialties such as radiology and dermatology. On the other hand, the remote monitoring method is a method that allows physicians to keep track of the conditions of their patients without having them come in for a checkup. Patients with diseases such as heart conditions, diabetes and asthma are good candidates for this service (Mexrich, 1995; Dasgupta, 2008).

Two broad aspects of technology are required to enable telemedicine using latest communication options. These are a network infrastructure and end user devices which allow exchange of relevant data between patients and care giver. The network need can be fulfilled by varying types of connectivity solutions that can include any wired or wireless access or a combination of the two. Any data network infrastructure based on copper wire or fiber optic cabling could provide the necessary connectivity for a telemedicine service to run on (iConcept, 2010).

Mobile phone networks, satellite technology through VSATs or a WiMAX system are among the possible wireless solutions. The Internet can be available on any of these platforms to provide additional flexibility and functionality when implementing telemedicine services. Regular PC's and mobile phones are the standard communication apparatuses that mainly make up the end users side of access devices in a telemedicine services scenario. However, specialized equipment used for such purposes as radiology and patient monitoring as well as lab machinery with digital output that can be transferred over the network are also part of the hardware most telemedicine solutions are composed of (iConcept, 2010).

2.4 Clinical Applications of Telemedicine

Applications of telemedicine technology reveal the range of medical fields found in the usual clinical medicine. That is to say that telemedicine has been useful in almost all fields of clinical medicine plus medical education. Even if the periods of maturity and development differ to a large extent among specialty, telemedicine is characterized in the greater part of medical specialties, (Krupinski, 2002).

A study made by Krupiniski (2002), revealed that tele-radiology and tele-pathology symbolize mainly full-grown as well as deep-rooted medical specialties in practicing and applying telemedicine technology. Here, a number of explanations can be mentioned. Particularly, within all specialties there is substantial stability or relationship as well as conventional application techniques. For instance, practitioners in the field of radiology and pathology rely greatly on illustration or medical images, rather than getting in touch with the patient, to formulate a diagnosis or discover anomaly.

The wide appreciation or recognition of the advantages of 'tele-radiology and tele-pathology' has directed to clear standards for quality assertion that defend the patient and the care giver equally. There is evidence in some of research works on illustration or image presentation and explanation existing prior to and following the employment of telemedicine technology. Overall, these situations helped the shift to as well as recognition of both tele-radiology and tele-pathology. Naturally, in the conventional clinical situation, the radiologist and pathologist work alone from patients (Krupinski, 2002).

Therefore, examining patient images or pictures intended for diagnostic uses via telemedicine is not considerably different from the usual approach. The major important feature that has placed them at the front position in telemedicine operation is that both radiology and pathology depend greatly on the explanation or interpretation of images. There is an image to be interpreted, how the image gets to the radiologist or the pathologist, and how it is presented, are certainly different in telemedicine. However, the fundamental undertaking which is the reading and interpretation of image data is similar (Field, 1996; Krupinski, 2002).

The “maturing” clinical uses classified to cover tele-psychiatry, tele-dermatology, tele-cardiology, and tele-ophthalmology. The last group of clinical applications identified by Krupinski consists of tele-surgery, tele-pediatrics, and emergency medicine. For the reason that, they are recently used applications the group named as ‘emerging’ fields of telemedicine application, (Krupinski, 2002).

2.5 The Benefits of Telemedicine

A number of advantages can be recognized by an enhanced utilization of telemedicine and there are several reasons motivating the desire for telemedicine. Benefits can vary from better observance in taking medicines, to better health care delivery in remote and underserved areas, to enhanced delivery of health care services outside hospitals and clinics, and improved exploitation of care providers (Hein, 2009).

Telemedicine technology permits communication of health care services to “wherever a patient is in need, from wherever the Doctors are online” (Annual Review of Public Health, 2000). The technology favors not only patients who are capable to obtain health care more efficiently; but also the health professionals who make more efficient their attempts to help extended number of patients (Annual Review of Public Health, 2000).

As stated out by Hjelm (2005) telemedicine technology can improve access and convenience to health care in remote areas; improve quality of health care; reduce health care costs especially travel costs of patients and health professionals; significantly minimize isolation and above all ensure safety and security of vital patient information for an identified period of time.

Other Research has proved that using telemedicine technology, chronic diseases conditions can be handled effectively; care for the elderly, home-bound and physically challenged patients can be improved; community and population health would also be improved; and lack or shortage of health professionals can also be addressed. It has the ability to empower patients concerning their own health and finally it was pointed out that this technology can become a source of innovative and creative employment field within the health sector (Hein, 2009).

2.6 Knowledge and Perception of Health Care Providers towards E-health and Telemedicine

The potential of telemedicine in health care delivery are well known but repeated initiatives particularly in developing countries have failed to sustain. As literatures identified widely mentioned cause of failure is the level of knowledge and perception of health professionals. It is true that the understanding of care providers, towards telemedicine is critical to its development. In areas where resistance to new ideas is very common it leads to the collapse of technology oriented modernizations (Gatit, 2008).

Libyan physicians' perception towards telemedicine was studied by Gatit (2008). In that study, a total of 41 individuals from different specialties who participated in a 'medical symposium on telemedicine' was assessed for their knowledge on a 4 part scale: "none", "Confused", "fair", and "excellent". The study disclosed the following result:

> "Most of them reported being confused about telemedicine (53.7%) and 14.6% were completely unaware regarding telemedicine before the symposium. Afterwards, 12.2% were found confused, 39% showed excellent understanding and 48.8% reported faire understanding. 97.6% supported the implementation of telemedicine in the country and appreciated the importance of establishing remote health services" (Gatit, 2008 p.3).

The research further showed that "before the symposium, 39 of the 41 participants said they did not support the establishment of telemedicine facilities in Libyan hospitals and following the meeting, 40 (97.6%) supported the scheme". As a final conclusion this study highlighted that "the knowledge and perception of Libyan doctors concerning telemedicine was extremely low', and even those who had some knowledge, were rather confused" (Gatit, 2008).

In other studies, for instance, the one that was done to explore physicians perception towards telemedicine in different countries, it was found that the outcome differ from 'conservative to hopeful/optimistic'. A study was made by Banjoko (2008) to assess Nigerian health care

providers' knowledge regarding telemedicine. In that study, about 200 health care providers were questioned on their view using questionnaire and interview. The final result indicated that "83 (41.5%) of the respondents had poor knowledge of telemedicine". This result underlined the need for stakeholders' wide discussion and public explanation on the subject prior to the formulation of strategy or policy on telemedicine (Banjoko, 2008).

A study entitled "current status of e-health awareness among health professionals in teaching Hospitals of Rawalpindi, Pakistan", (2009) indicated that amongst 186 health care professionals surveyed, 57% of them had heard of e-health prior to the survey. The same study further disclosed that 28% of the respondents were of the opinion that healthcare professionals should hear about e-health during their stay in health college and universities. In that research, 50.5% of the respondents believed that e-health services were generally useful for developing countries. The study exhibited a lack of sufficient knowledge or information about e-health among health care specialists (Shoaib, 2009).

Hanson D, Calhoun J, Smith D (2009) conducted a longitudinal study in which the pre and post telemedicine encounter attitudes of healthcare providers were compared in order to discover whether and how experience with telemedicine changes their attitudes toward telemedicine. In this research, attitudinal changes of providers who had used telemedicine formerly were contrasted to those practicing telemedicine for the first time.

Care givers located in two telemedicine projects in Georgia and Nebraska were subjects of the study and accordingly the necessary data were collected. The projects used synchronous or real time videoconferencing and minor devices to conduct telemedicine consultations. About 87 health care providers had completed the questionnaires. The query centered on the expected impact of telemedicine on their efficiency and skill to prescribe treatment. To measure their response a 3-point scale was used. The result identified that about 79.3% of the care givers did not change their attitudes subsequent to the use of telemedicine. The shift in attitude in the minority (n=18) of providers who did change their minds after the telemedicine encounter was more positive among those who used telemedicine for the first time as compared to those with experience. This result proposes that practice with

telemedicine results in more positive attitudes that may not be realized in subsequent interactions with the technology (Hanson; Calhoun; Smith; 2009).

Whitten, P and Franken, EA (1995) also tried to investigate knowledge of, attitudes to, and use of interactive telemedicine for specialist consultation among rural practitioners in Kansas. For the study, 28 rural primary-care practitioners at seven remote health-care facilities in six locations were interviewed. Analysis of the interviews showed common but external knowledge of telemedicine, appreciation of the value of the technology, but relatively low usage of the telemedicine service available among 32% of the respondents.

According to the finding, physicians were not appearing to be afraid of change and it was recommended that "further growth in the use of telemedicine will depend on efforts directed towards physicians which are aimed at creating a more user-friendly environment and at accommodating the referral practices of potential users" (Whitten and Franken, 1995).

Another study entitled "Awareness and attitudes to telemedicine among doctors and patients in India" was also conducted by Meher, SK (2009). Information about knowledge and feelings to telemedicine was collected from 143 doctors and 121 patients. The result pointed out that the majority of doctors felt that telemedicine was essential and their attitude was similar in all age groups. Among those surveyed a total of 86 doctors had used telemedicine. In addition to this the study further explored that, 100 of the 121 patients were not aware of telemedicine. Though, while the idea was explained, majority of the patients had an encouraging outlook to telemedicine. Finally, the researcher recommended that appropriate hospital training programs should be planned for all doctors and awareness creation should also be done for patients. These, according to the researcher, will assist in future deployment of telemedicine technology (Meher, 2009).

2.7 Telemedicine Practice in Africa

For African countries telemedicine is not a novel practice. It was revealed in one study that, doctors in London made a diagnosis of crouzon's syndrome in a patient in Swaziland, using satellite communication in 1984. In the same year, there was also a twice-weekly clinical case conferencing between Canada, Kenya and Uganda, with ECGs passed on from Mulago in Kampala to the health science center at St John's in Canada. It was also stated that, in 1993 a US army in Ethiopia exercised a Satellite based store and forward telemedicine (Abebe, 2007).

African doctors as well take part in various global store-and-forward projects which have been in operation for some years. Nevertheless, application of telemedicine services in Africa has been restricted and the apparent explanations discovered incorporate the lack of infrastructure, the shortage of health professionals and telecommunication cost particularly the cost of bandwidth. Lack of training for the health professionals in simple store- and-forward telemedicine is repeatedly ignored. The assumption is made that everyone knows how to take a photograph and send and receive an e-mail message.

Three regional hospitals in South Africa have linked to the Moorefield's Eye Hospital ophthalmology projects in England for second opinion services by videoconference and email, and their web-based second-opinion service is used by doctors in South Africa, Gambia, Tanzania and Ghana. Ophthalmologists in Ethiopia and Tanzania were also offered a store and forward telemedicine service by The Orbis Cyber Sight Program. The Swinfen Charitable Trust's store-and-forward telemedicine service has been used by Doctors in Sierra Leone, Ethiopia, Malawi, Uganda and Zambia. At the beginning the service was only tele-pathology service and later on transformed into dermatology and radiology services. Telemedicine service has also set up by Private and multinational companies both for their employees and for private patients who are able to pay for international service (Kennedy C, 2004).

In the Francophone African countries, the RAFT (Résau en Afrique Francophone pour la Télémédicine) project, based at Geneva, has been running at eight sites in Mali since 2001,

with additional sites in Mauritania, Morocco, Burkina-Faso, Senegal, Tunisia, Cameroon, Côte d'Ivoire, Madagascar, Djibouti and Niger coming on line in 2005. This project ran 98 webcast teaching sessions from Geneva and Bamako during the first 5 years. Unfortunately, by the end of 2005, only 14 international tele-consultations, for neurosurgery, radiology and dermatology, were successful and the project has noted that the 'high expectations of satellite technology are still unmet, as the cost of connectivity remains too expensive for the countries (Geissbuhler, 2007).

Another organization participated in telemedicine initiative in Africa was the African Medical and Research Foundation (AMREF), which was founded in 1957 and based in East Africa. It has a long history as a flying doctor and provision of radio doctor service. AMREF is involved in developing four store-and-forward telemedicine sites in Kenya and Tanzania.

Furthermore, a trial store-and-forward telemedicine program was run in Angola and the Democratic Republic of the Congo, by a non-governmental organization called Promoting Social Development in Africa. But, the program was not sustainable and ended in 2005. Botswana has identified the need to set up telemedicine services, and the Botswana–Baylor Children's Clinical Centre of Excellence has set up the first telemedicine site in the country. Benin has a histopathology store-and-forward service with Paris, for the management of Brule ulcers. Countries like Burkina-Faso and Chad are part of a tele-epidemiology network with Paris, and also participate in the RAFT project. Burundi participates in the iPath program. Chad participates in the RAFT program (Edirippulige, 2007).

In addition to pilot projects that are performed in a collaborative program between the University of California and Intel Research Company, real time approaches of telemedicine service were provided in Ghana. Currently the country is in the process of expanding its fiber optic connection to improve the capacity of service.

In Kenya, AMREF group has set up telemedicine pilot projects. The Aghakhan Hospital has telemedicine links with North American Hospital. Four hospitals in Mali established a store and forward tele-radiology service via switched telephone links with Geneva that come operational 2005 (Ojo, 2006). Mauritius has also launched its first telemedicine project in

1997, which was failed soon. Furthermore, a new store & forward service between India and a private Hospital typically for radiology and ECG was set up in 2005 (Geissbuhler, 2007).

Telemedicine initiative had also taken place in Mozambique, Namibia, Niger and Nigeria from 1998 to 2006. Mozambique's tele-radiology service that was operating in 1998 was failed to sustain. A nuclear medicine telemedicine link was established between Namibia, South Africa and UK by the year 2003. Nigeria has a tele-epidemiology network with France for monitoring infectious disease. In Nigeria, the first telemedicine center was launched in 2006 between a private hospital and a hospital in India. It is the only country that has 'Africa's first and only National telemedicine Association. Anesthesia Overseas was set up a telemedicine distance education resource centre in one of the Eritrean hospital and was assisting in training nurse anesthetists (Geissbuhler, 2007).

In Ethiopia, there have been some projects in the past few years that were started with the intention of utilizing telemedicine to provide health care in rural areas. One such undertaking has been a collaborative effort between the governments of Ethiopia and India. This project was begun as part of an initiative by the Indian government to support all African nations in providing medical services to their citizens through technology. This project was launched in July 2006 to connect hospitals in Ethiopia with Care Group hospitals situated in the southern Indian city of Hyderabad.

The objective of the initiative included connecting the Tikur Anbessa Hospital in Addis Ababa to Care Hospital in Hyderabad, India. The project also had plans to link 10 hospitals including Nekemete Hospital to the Black Lion Hospital. The cost is estimated at $2.23 million and uses satellite and fiber optic links for communication purposes (Abebe, 2007).

2.8 Ethical and Legal Aspects of Telemedicine

Despite increasing use of telemedicine, there has been little discussion about the ethical and legal issues surrounding it. New concepts in telemedicine health care provision presented new legal and ethical challenges to practice. These challenges initially appear to fit into two main categories: issues relating to conventional medicine; and those specific to telemedicine. A less obvious third category relates to jurisdictional issues, where the legal implications of using telemedicine depend on local laws and healthcare practice (Asadi and Akhlaghi, 2002).

Layman (2003) identified info-ethics, which is, applying ethical issues to telecommunication and information technologies. Telemedicine can be used to access expert advice and is already used in several areas including radiology, cardiology, dermatology, home monitoring and information for patients and careers and just like conventional healthcare, confidentiality, consent and non-malfeasance are basic principles in telemedicine practice.

Randell (1998) discussed the ethical principles of beneficence to justify using technologies to increase access to care and reduce costs. They argued that an efficient service meant a better service in terms of quality of care, mainly by increasing accessibility by minimizing traditional barriers created by time and location. However, only people with the resources to gain access benefit. Control of data remains in the health organization's jurisdiction. This is an advantage when coordinating a multi-professional team as data can be readily dispersed.

The principle of confidentiality in medical ethics dates back to Hippocrates. It has been developed in various codes, which states that a doctor must preserve 'absolute confidentiality in all he/she knows about his patient' even after the patient's death. Telemedicine creates special problems due to the involvement of non clinical personnel in tele-consultations and the vulnerability of transmission lines to security breaches. Since patients trust practitioners with personal information, it is reasonable for the obligation to fall on professionals to protect the confidentiality of that data.

The British Medical Association (2005) provided three principles to guide practice: Patients' right to privacy regarding medical details and records; Patients' privacy should be

maintained unless waived in a meaningful way; Disclosure of information should be related to the prevailing medical condition to fulfill the immediate and specific purpose of treatment.

Rapid implementation of telemedicine, combined with major social change and mobility, means ongoing discussion is needed across international boundaries by governments and professional organizations. Telemedicine demands that an electronic medical record of the patient be shared across state line. As among the network partners, who will have access to extract relevant network information, who is the ultimate caretaker of the medical record and who is responsible to ensure the patients privacy?

Federal legislations regulating the confidentiality and privacy of data passing over an interstate network is lacking. For the most part, confidentiality and privacy laws have been enacted on a state or local basis without regard to overlap or consistency across state lines. Today, confidentiality, privacy, and data protection depend on state laws, the type of data processed, and the use of the data internally and externally by the provider. Unfortunately, the lack of legal guidance and uniform legislation leaves health care providers with the traditional legal responsibility for the confidentiality of the patient's record even though that electronic medical record is available for access and use by entities outside of the provider's control.

Patient privacy during tele-health consultations should be maintained as much as possible, although it is understandable that privacy might be limited when such technology is used (Mair and Whitten, 2000). Healthcare professionals should ask patients if they have any questions that might need more privacy than provided. It is important to explain to patients that privacy and confidentiality cannot be guaranteed in telemedicine, as medical records can be shared with other practitioners involved in their care. The nature of the professional-patient relationship changes dramatically, as telemedicine challenges traditional concepts of privacy and confidentiality (Telemedicine Association of Oregon, 2004).

Some studies also explore issues regarding licensure and accreditation; it is widely held that to practice medicine, a person must have received the relevant education and training and reached a pre-set standard. Eventually, he or she is given a license to practice. However,

there is no universal agreement about either the length or content of training, or the standards needed to qualify as a doctor. Thus, physicians accept that to practice in a country other than the one they originally qualified in they will usually need to take additional examinations, e.g. the United States Medical Licensing Examination (USMLE), and satisfy other bureaucratic requirements such as providing evidence of their primary qualifications and the standards achieved.

The process may require the clinician to appear before a country's licensing board and take examinations in that country- a potentially time-consuming and expensive business. There is a clear need for interstate licensure based on mutual recognition. This is the 'same principle that allows doctors to practice in any member countries of the European Union or the states of Australia' (American Medical Association, 1997; Stanberry, 1998; Asadi, 2002).

CHAPTER THREE

OBJECTIVES OF THE STUDY

This study has the following general and specific objectives:

3.1 General Objective:

The general objective of this study is to assess health care professionals perceived knowledge, skill and attitude regarding telemedicine application and benefits and review the current status of telemedicine units of Tikur Anbessa and Nekemete Hospitals in terms of Manpower, Infrastructures, Equipment and level of utilization.

3.2 Specific Objectives:

The specific objectives are:

- To assess the level of knowledge of health professionals towards telemedicine systems and awareness of clinical applications and benefits.
- To describe recognition, and attitude of health professionals towards the value of telemedicine and willingness to apply it in health care practice.
- To Review the current status of telemedicine centers of Tikur Anbessa and Nekemete Hospitals.

CHAPTER FOUR

METHODS & MATERIALS

4.1 Study Area:

The study took place in Tikur Anbessa Hospital which is found in A.A. and Nekemete Hospital, in Wollega.

Addis Ababa has a total population of 3,147,000. There are 5 government and 28 private owned hospitals, and 24 government owned Health centers. There are 133 physicians, 1,366 Nurses and physician to population ratio is 1:23,662 (MOH, 2008). Tikur Anbessa Hospital is the largest teaching and referral hospital in the country. Health care professionals currently working full time in this hospital were 540. In addition to the provision of medical services, the hospital is involved in teaching health professionals in various fields of medicine and involved in local and international research.

Nekemete Hospital which is found in western Oromia is about 331Km. to south west of Addis Ababa. It was founded in 1932 GC. The Hospital is organized under the Oromia Health Bureau and supervised by the Governing board. It is a zonal hospital and provides medical service to the residence of the town and patients in the surrounding. The hospital currently has about 120 health care providers and involved in the training of mid-level health professionals.

4.2 Study Design:

The study design is both quantitative and qualitative. It uses stratified random sampling technique. The objectives were set to be best achieved through a survey approach using a semi structured and self completion questionnaire. An interview with purposely selected key informants and observation on the practice of telemedicine units has been made.

4.3 Study Population:

The study is limited to respondents serving in Tikur Anbessa and Nekemete Hospitals. The study population covers health care providers that include Specialists, General Practitioners, Nurses, Midwives, Laboratory technologists, Radiographers, Physiotherapists, Pharmacist, and Anesthetists working full time in both Black lion i.e. 540 and Nekemete Hospitals i.e. 120 that totals **660**.

4.4 Sample Size:

The sample size of **385** representing approximately 50% of the study population of 540 has been selected using a table of random figures from the TAH clinical staffs. In addition to this **120 (**all) clinical staff working full time in Nekemete hospital is the subject of the study. The total sample size is (385+120) = **505**.

The formula for estimating the sample will be:

$$N = \frac{z^2 \text{ x } (P)\ q}{d^2} \qquad \frac{1.96^2 \text{ x } (0.5)\ 0.5}{0.05^2} = 385$$

z=1.96 = Z value for p = 0.05 or 95% confidence limits

P = Estimated prevalence

q= 1-p

d = Desired precision (for example, 0.05 for ± 5% non-response rate)

4.5 Sampling Procedures:

Health care providers currently working full-time in TAH are included in the sample. But for those working in Nekemete hospital all of them are subject of the study without sampling. Participants from the TAH were selected using stratified random sampling method. The strata were made based on their professional category.

In TAH the sampling frame is divided in to the following groups of Strata: Specialists, General Practitioners, Nurses, Midwives, Laboratory technologists, Radiographers, Physiotherapists, Anesthetist and Pharmacist. A complete list of population obtained and a random number table was constructed. The total numbers of this staffs is **540** and the percentage in each group is calculated proportional to their size and provides with a sample of 385 health care professionals from Tikur Anbessa Hospital. Those randomly selected from the TAH and all providers from Nekemete received a self-administered questionnaire by data collectors and collected back after completion.

Table 4.5.1 Composition of Professional category in the Sample Population

Professional Category	Total Staff	Required Proportion of Each Category	Required Number in the Sample
Specialist	9	2%	8
GP	8	2%	8
Nurse	397	74%	286
Midwives	13	2%	8
Radiographers	18	3%	11
Lab Technologist	41	8%	30
Pharmacist	18	3%	11
Physiotherapist	23	4%	15
Anesthetist	13	2%	8
		Total	**385**

4.6 Study Variable

The study has the following variables:

Dependent Variable

- Skill of ICT
- Knowledge of Telemedicine
- Awareness of Telemedicine Application
- Awareness of Telemedicine Benefits
- Willingness to use telemedicine

Independent Variable

- Age
- Sex
- Educational Level
- Work Experience
- Computer literacy status
- Profession

4.7 Data Collection Procedures:

In this study primary and secondary sources of information was collected and utilized. Primary data sources employed was the administration of semi- structured questionnaire to the 505 respondents. In addition to this, an interview was made with key informants with the help of pre-distributed open ended interview guide (directors of the two hospitals, telemedicine center coordinator, staffs of the center) to explore the current status of the center that adds to a total of 5 individuals.

The contents of the questionnaire especially that measures knowledge and attitude/perception towards telemedicine were standard items adopted from other studies and composed of 19 items. The reliability of these items was tested for Cronbach's Alpha greater than 0.7 (See Annex 6). Yes/No options are provided to evaluate knowledge level. Status of respondents was assessed by analyzing response to these set of questions. Perception/attitude and willingness measured through 5 item opinion questions using a five-point likert scale 'Strongly Disagree =1', 'Disagree= 2', Don't know= 3', 'Agree= 4', and 'Strongly Agree =5'. Higher scores (5) represented more positive perception/attitude towards telemedicine and willingness to use the technology. The process was handled by two data collectors in both Hospitals with informed consent from the participants.

Secondary sources of information that is reviewed in the study includes Medical Journals, ICT Journals, Books, Health statistical records and electronic resources available online as well as offline.

4.8 Data Analysis:

Data generated from the questionnaire is coded and entered into the computer system and analyzed statistically using Statistical Package for Social Scientists (SPSS) Version 16.0. Descriptive statistics including frequency tables and percentages is compiled. Content analysis for free response qualitative data that was obtained from the interview is also undertaken using MS word program.

4.9 Operational Definitions:

Basic Telemedicine Systems and Services: A system that incorporates computer, telecommunication and health care technologies to provide health care & health education from distance based on store and forward or real time interaction with the aim of improving clinical practice and reducing unnecessary referral.

Information Communication Technology (ICT): For the purpose of this study ICT is defined as: Tools that facilitate communication and the processing and transmission of information and the sharing of knowledge by electronic means. This encompasses the full

range of electronic digital and analog ICTs, from radio and television to telephones (fixed and mobile), computers, electronic based media such as digital text and audio-video recording, and the Internet.

Knowledge on ICT: Mainly focuses on respondent's exposure, knowledge, access and utilization of Information communication technologies like computers, Internet and electronic documents. The minimum level for having knowledge on ICT refers to having an introductory level training in computer or Information Technology area.

Satisfactory Knowledge on ICT: Respondents who have at least an introductory level training on computer or IT.

Unsatisfactory Knowledge on ICT: Respondents who do not have any kind of training on computer or IT.

Knowledge of Telemedicine Systems and Services: Refers to the respondent's level of awareness towards basic telemedicine systems and services. There are 8 knowledge variables identified to assess respondents level of knowledge which have an option of Yes and No. Based on that Poor, Fair, Good and Very Good Knowledge on Telemedicine is identified**:** Marking '**Yes**' for all 8 items have a value of 1, otherwise it will be 0. The sum of all eight items is rated to categorize the knowledge level. Based on previous studies, scoring 1 - 2 out of the 8 items is set as having Poor knowledge, scoring 3-4 set as having Fair knowledge, scoring 5-6 set as having Good knowledge and scoring 7-8 as having Very Good knowledge.

Perception/ Attitude on Telemedicine: Respondents view, feeling or opinion towards telemedicine applications and benefits and accessing or using telemedicine technology.

Positive Perception/ Opinion (Favorable Attitude): Respondents who answered affirmatively (positively) to a set of items on perception/attitude towards Telemedicine

Negative Perception/Opinion (Unfavorable Attitude): Respondents who answered negatively for a set of items of perception/attitude towards Telemedicine.

Tele-consultation: is the use of information and communications technology to enable clinical consultation between geographically separated individuals such as health care professionals and their patients or health care professionals engaged in diagnostic, mentoring, or other clinical decision-making activities related to the delivery of health care services.

Tele-diagnostics: is the use of information and communications technologies to enable the diagnosis of a patient between geographically separated individuals. Tele-diagnostics is usually a real time and live dialogue between the specialist and the doctor at the remote site with regard to the diagnosis of the patient's illness. But it is also possible that Tele-diagnostics could be of a Store and forward type where the patient's information is transmitted to the TSC and the specialist gives his expert opinion after a specific period of time.

Tele-health: is the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education and training, public health and health administration

Telemedicine: Telemedicine involves the use of modern information technology, especially two way interactive audio and video telecommunications, computers and telemetry, to deliver health services to remote patients and to facilitate information exchange between primary care physicians and specialists at some distances from each other.

Telemedicine Consultation Centre (TCC): is the site where the patient is present. In a Telemedicine Consulting Centre, equipment for scanning /converting, transformation, communicating for medical information of the patient can be available but it is not essential.

Telemedicine Specialty Centre (TSC): is a site, where the specialist is present. He can interact with the patient present in the remote site and view his reports and monitor his progress.

Willingness to Use Telemedicine: Refers to respondents choice or decision or willfulness to exercise/ practice telemedicine in their clinical activities.

4.10 Data Quality Control:

The quality of data was assured by applying the following methods:

- Data was collected using a pretested questionnaire, training for the two data collectors was given on the data collection tools and how the data collection be conducted.
- Continuous supervision was made by the principal investigator to control the data collection procedure
- Checking for completeness of data collected was done each day after data collection.

4.11 Ethical Consideration:

Ethical clearance to conduct the study was obtained from Joint Academic Commission. In addition to this, the Institutional Review Board of the Faculty of Medicine (IRB) has approved this study. Informed consent from each participant was sought after clear explanation about the purpose of the study and returning the filled questionnaire taken as agreement. Moreover, the research has nothing to do with the personal identifiers of the respondents and hence there will be no problem of the privacy and the confidentiality of individuals who participate in the study.

4.12 Dissemination of the Results:

As partial fulfillment of the requirement for degree of MSC in health informatics, this thesis was presented for the University Community. It can also be presented on different conferences/workshops that have relevance to the topic. The hard copy is also made available in the AAU libraries.

CHAPTER FIVE

FINDINGS OF THE STUDY

5.1 Response Rate

In this survey a total of 520 self-administered questionnaires were distributed during the month April – May 2010. Among these 475 of them were returned which makes the response rate of 91%.

Table 5.1.1: Response Rate of Distributed Questionnaire by Hospital

Hospital	Distributed	Returned	Response Rate
Tikur Anbessa H	400	362	90.5%
Nekemete	120	113	94.2%
Total	520	475	91%

5.2 Demographic Profile of Respondents

5.2.1 Age - Sex Characteristics

In this study a high proportion of respondents 58.5% (n= 278) were females. All age ranges were well represented within the survey with the least proportion of the over 50's age group (3.6%, n= 17). The largest proportion of all grades fall within the age category < 30, (49.9%, n= 238) and 35.6% (n= 169) of the respondents categorized under the age group of 30 to 39 years. Only 10.9% were found in the age group of 40 to 49.

Table 5.2.1.1: Age-Sex Distribution of Respondents by Hospital

Age-Sex Category		Hospital					
		Black Lion		Nekemete		Total	
		Frequency	%	Frequency	%	Frequency	%
Age group	<30	181	50.0%	56	49.6%	237	49.9
	30-39	136	37.6%	33	29.2%	169	35.6
	40-49	30	8.3%	22	19.5%	52	10.9
	50+	15	4.1%	2	1.8%	17	3.6
	Total	362	100%	113	100%	475	100%
Sex	F	230	63.5%	48	42.5%	278	58.5
	M	132	36.5%	65	57.5%	197	41.5
	Total	362	100%	113	100%	475	100%

5.2.2 Professional Category and Work Experience

Nurses comprised the largest single group included in the survey (73.5%, n= 349) with the Anesthetists, the smallest group in number (.8%, n= 4). Laboratory workers represent 6.5%, Pharmacist represents 4.8%, General Practitioners represent 3.2%, Physiotherapists represent 2.9% and Radiographers represent 2.7% of the respondents. Both Specialists and Midwives represent 1.9% and Health Officers accounts 1.7% of the total respondents (See Table 5.2.2.1)

The highest proportion (42%, n= 200) of all respondents had 5-9 years experience and 2.5% (n= 12) had 15-19 years experience. About 31.2% of the respondents had less than 5 years experience followed by the 10-14 years category that accounts for 12.5% of the

respondents. Health care providers having 20 and more years of experience amounts 11.4% (n= 54).

Table 5.2.2.1: Respondents Professional Category by Length of Work Experience

Professional Category	Experience					
	Less than 5 years	5 - 9 years	10 - 14 years	15 - 19 years	20 and above years	Total
Specialist	5	3	-	-	-	**8**
GP	10	3	2	-	-	**15**
Nurse	99	156	47	7	40	**349**
Pharmacist	9	8	3	-	3	**23**
Lab Technologist	12	9	3	3	4	**31**
Health Officer	2	4	-	1	2	**9**
Radiographer	3	4	3	1	2	**13**
Physiotherapist	6	7	1	-	-	**14**
Midwives	1	3	2	-	3	**9**
Anaesthetists	1	3	-	-	-	**4**
Total	**148**	**200**	**61**	**12**	**54**	**475**
Percent	**32.2%**	**42.1%**	**12.8%**	**2.5%**	**11.4%**	**100%**

5.2.3: Qualification

The highest number of respondents, 53.5% (n= 254) had a Diploma and the smallest, 2.1% (n= 10) had MSC + MD. BSC holders accounts for 44.4% of the respondents.

Table 5.2.3.1: Frequency of Respondents Qualification by Hospital

Qualification	Hospital			Percent
	Tikur Anbessa	Nekemete	Total	
MSC +MD	7	3	10	2.1%
BSC	183	28	211	44.4%
Diploma	172	82	254	53.5%
Total	362	113	475	100.0%

5.3 Exposure to Information Technology (IT)

5.3.1 Training in IT area

Among the respondents, the largest proportion, 51.8% (n=246) had an introductory level training in computer or Information technology areas and the least category, .2% (n= 1) had a BSC Degree in IT. 27.2% (n= 129) had never attended training of any type in IT, 13.5% (n= 64) had a certificate and 7.4% (35) had a Diploma in IT. Comparing within the professions, 6 of the 8 specialists, 7 of the 15 GP, 173 out of 349 Nurses, 15 of the 23 Pharmacists, 17 out of 31 Lab technicians have introductory level computer training.

Table 5.3.1.1: Respondents Computer Literacy Level by Professional Category

Professional Category	Computer Training Type					
	Never Attended	Introductory Level	Certificate	Diploma	BSC	Total
Specialist	2	5	1	-	-	8
GP	4	7	2	2	-	15
Nurse	99	173	50	26	1	349
Pharmacist	3	15	2	3	-	23
Lab Technician	9	17	4	1	-	31
Health Officer	2	5	1	1	-	9
Radiographer	2	9	1	1	-	13
Physiotherapist	3	9	1	1	-	14
Midwives	5	3	1	-	-	9
Anaesthetist	-	3	1	-	-	4
Total	**129**	**246**	**64**	**35**	**1**	**475**
Percent	**27.2**	**51.8**	**13.5**	**7.4**	**.2**	**100.0**

5.3.2 Usage /Access to Computer

For question that asks respondents whether they use or do not use computer in their work or out of work environment, 67.6% (n=321) responded to use and 32.4% (n=154) were not use computer at all.

Table 5.3.2.1: Respondents Access to Computer by Hospital

Using Computer	Hospital		Total	Percent
	Tikur Anbessa	Nekemete		
Yes	272	49	321	67.6%
No	90	64	154	32.4%
Total	362	113	475	100%

5.3.3 Purpose of Using Computer

A total of 321 (67.6%) respondents who are users of computers perform one or more tasks that require application of computer in their work or outside. Among these respondents, the largest proportion 169 (35.6%) are looking for computers in order to access the Internet and the least category 4 (.8%) entertain with computers. While 52 (10.9) respondents use it for Word Processing and/or Data management.

Table 5.3.3.1: Frequency of Purpose of using Computer (Computer Application)

Computer Application	Frequency	Percent
For word processing, database management	52	10.9%
For Internet Access	169	35.6%
Entertainment	4	.8%
Two or more of the options	96	20.2%
Total	321	67.6%
Non Users	154	32.4%
Grand Total	475	100.0%

5.3.4 Internet Use and Preference of Application Areas

Among user of computer, 63 (13.3%) of the respondents search for information on the Internet on a daily basis, 162 (34.1%) use Internet weekly and 2 (.4%) of them use twice a week. Besides, 51 (10.7%) look for Internet monthly and 42 (8.8%) use it less than once within a month.

Furthermore, among the 321 users of Internet the popular application used by 180 (37.9%) of the respondents is sending and receiving e-mail messages, while 27 (5.7%) of them use it for web browsing. Again 102 (21.5%) respondents reported to use Internet for two or more of the options given i.e. web browsing, e-mail service and/or electronic document searching. Twelve (2.5%) of them reported to use Internet only for electronic document downloading purpose.

Table 5.3.4.1: Frequency of Internet Use by Preference of Application Areas

Frequency of Using Internet	Preference of Internet Application				Total	Percent
	Web Browsing	E-Mail	Electronic Document Download	Two or more of the Options given		
Daily	5	17	7	34	63	19.6
Weekly	12	97	3	50	162	50.5
Twice a week	-	-	-	2	2	.6
Every Other Day	-	1	-	-	1	.3
Monthly	6	34	0	11	51	15.9
Less than once in a month	4	31	2	5	42	13.1
Total	27	180	12	102	321	100%
Percent	8.4	56.1	3.7	31.8	100%	

5.3.5 Searching Health Related Websites

For a question asking respondents whether they are searching health related websites or not by the time they are using the Internet, only 157 (33.1%) reported positively. The highest proportion 318 (66.9%) has never searched websites related to health.

Table 5.3.5.1 Frequency of Searching Health Related Websites

	Yes	%	No	%	Total	%
Searching Health Related Websites	157	33.1%	318	66.9%	475	100%

5.4 Knowledge of Basic Telemedicine Systems and Services, Clinical Application areas and Benefits

5.4.1 Knowledge of Basic Telemedicine Systems and Services

Knowledge level of respondents to basic telemedicine systems and services were measured with a Yes and No options given for a set of 8 selected knowledge variable items. The items are listed in Table 5.4.1.1 below.

The result indicated that, 65.2% of TAH and 90.3% of NH respondents know the existence of an alternative way of patient care other than conventional doctor-patient relation. Those who respond positively to the knowledge variable item 'telemedicine means providing health care from distance' accounts for 87.8% and 96.5% from TAH and NH respectively. Telemedicine has the potential of reducing unnecessary referral for 88.1% of TAH and 100% of NH respondents. Computer, telecommunication and health care technologies applied in telemedicine service provision for 87.3% and 96.5% of TAH and NH respondents respectively. Store and forward is accepted as an approach in telemedicine service by 58.4% and 74.3% of TAH and NH respondents respectively.

As it is seen in Table 5.4.1.1 below, there is no significant difference among respondents of the two hospitals to knowledge variable indicated at number 7 & 8 at p-value >0.05. Inspection of the data indicated that both respondents of the hospitals have the same level of knowledge towards the role of telemedicine in improving clinical practice and its health educational value. Eighty five percent of care providers of both hospitals were answering yes to these items. Whereas, for other knowledge variables there is significant difference between the respondents of the two hospitals.

Table 5.4.1.1: Response to Knowledge Variables by Hospital

Knowledge Variables	Response	Hospital				Chi-Sq.	Sign.
		Black Lion		Nekemete			
		Frequency	%	Frequency	%		
1.There is an alternative way of patient care	**No**	126	34.8%	11	9.7%		
	Yes	236	65.2%	102	90.3%	26.321	.000
2. Telemedicine means providing health care from distance	**No**	44	12.2%	4	3.5%		
	Yes	318	87.8%	109	96.5%	7.021	.008
3. Telemedicine Reduce Unnecessary Referral	**No**	43	11.9%	-	-		
	Yes	319	88.1%	113	100.0%	14.728	.000
4. Computer, Telecommunication & Health Care Technologies applied in Telemedicine	**No**	46	12.7%	4	3.5%		
	Yes	316	87.3%	109	96.5%	7.668	.006
5. Store & Forward is an Approach in Telemedicine	**No**	150	41.6%	29	25.7%		
	Yes	211	58.4%	84	74.3%	9.223	.002
6. Real Time is an Approach in Telemedicine	**No**	136	37.7%	22	19.5%		
	Yes	225	62.3%	91	80.5%	12.807	.000
7. Telemedicine improve Clinical Practice	**No**	52	14.5%	16	14.2%		
	Yes	306	85.5%	97	85.8%	.009	.923
8. Telemedicine has Health Educational Value	**No**	64	17.8%	18	15.9%		
	Yes	295	82.2%	95	84.1%	.215	.643

(Pearson Chi-Square Tests. The Chi-Square Statistic is Significant at the 0.05 level)

As described in table 5.4.1.1 above, for the eight knowledge variable items, Yes responses have given a value of 1 point and No response has no value. The results of all respondents marking Yes to each item were summarized in Table 5.4.1.2 below. Accordingly, 25.7% (n=91) of TAH respondents and 61.9% (n=70) of NH respondents were answered correctly all the eight items and 24.3% (n=86) of TAH and 11.5% (n=13) of NH respondents were answered seven of the eight items (knowledge variables). Furthermore, 18.1% (n=64) of TAH and 9.7% (n=11) of NH

respondents were answered six of the eight items, while, two respondents from TAH correctly answered only one of the eight items.

Table 5.4.1.2: Summary of Knowledge Score of Respondents to Basic Telemedicine Systems and Services

Knowledge Score of Respondent (Result)	Hospital			
	Tikur Anbessa		Nekemete	
	Frequency	%	Frequency	%
1	2	.6%	-	-
2	9	2.5%	1	.9%
3	14	4.0%	1	.9%
4	34	9.6%	7	6.2%
5	54	15.3%	10	8.8%
6	64	18.1%	11	9.7%
7	86	24.3%	13	11.5%
8	91	25.7%	70	61.9%

Based on earlier researches done on knowledge assessment the score of respondents were again sorted to set their knowledge level. Accordingly, scoring 1 - 2 out of the 8 items is classified as having Poor knowledge, scoring 3-4 as having Fair knowledge, scoring 5-6 as having Good knowledge and scoring 7-8 set as having Very Good knowledge.

A total of 467 respondents answered to these items. Among these, 3% of TAH and .9% of the Nekemete Hospital respondents identified as having poor knowledge, 13.3% from TAH and 7.1% of Nekemete Hospital respondents belong to the group of having Fair knowledge, 33.4% of TAH and 18.5% of Nekemete Hospital respondents identified as having Good knowledge, and 50% of the TAH and 73.4 % of Nekemete Hospital respondents as having Very Good knowledge.

Table 5.4.1.3: Respondents Knowledge Level of Basic Telemedicine Systems & services by Hospital

Knowledge Level	Hospital			
	Tikur Anbessa		Nekemete	
	Frequency	%	Frequency	%
Poor	11	3.0%	1	.9%
Fair	48	13.3%	8	7.1%
Good	118	33.4%	21	18.5%
Very Good	177	50%	83	73.4%
No Response	8	2.2%	-	-

5.4.2 Clinical Application Areas of Telemedicine

For a question asking respondents to choose clinical areas in which telemedicine can be applied (clinical application areas), the highest percentage 52.6% (N= 250) identified all provided list that includes dermatology, radiology, cardiology, ophthalmology and physiology as applicable specialty areas. Telemedicine's application only to Radiology is indicated by 10.5% of the respondents. Only Cardiology is chosen by 6.9% of the respondents and only Dermatology is indicated by 6.7% of the respondents. Among the list Ophthalmology and Physiology were chosen by 3.6% & 2.9% of the respondents respectively. On the other hand, 59 (12.4%) of them identified two or more of the options given as telemedicine application areas.

Table 5.4.2.1: Respondents Awareness on Telemedicine Clinical Application Areas by Hospital

Application Areas	Hospital			
	Tikur Anbessa		Nekemete	
	Frequency	%	Frequency	%
Dermatology	30	8.3%	2	1.8%
Radiology	46	12.7%	4	3.5%
Cardiology	30	8.3%	3	2.7%
Ophthalmology	17	4.7%	0	.0%
Physiology	12	3.3%	2	1.8%
All of the above	162	44.9%	88	77.9%
Two or more of the above options	45	12.5%	14	12.4%
Other (Pathology, surgery, psychiatry...)	9	2.5%	-	-
I don't know	10	2.8%	-	-

5.4.3 Telemedicine Benefits

For an option given to respondents to choose among benefits of telemedicine systems, the highest proportion, 49.5% (n= 235) identified all options that includes the system will improve quality of care; improve access and convenience; reduce cost; and ensure safety and security of patient information. Twenty four percent of them identified that the system only improve quality of care, 5.1% indicated that it only improve access and convenience and .8% of the respondents indicated the system benefits only in ensuring safety and security of patient information. The remaining 19.3% of the respondents choose two or more of the given options as benefits of telemedicine.

Table 5.4.3.1: Respondents Awareness of Telemedicine Benefits

Benefits	Frequency	Percent
Improve Quality of Care	**116**	**24.4%**
Improve Access and Convenience	**24**	**5.1%**
Reduce Cost	**4**	**.8%**
Ensure Safety and Security of Patient Information	**4**	**.8%**
All of the Above	**235**	**49.5%**
Any two or more of the above options	**92**	**19.3%**
Total	**475**	**100%**

5.4.4 Source of Information on Telemedicine

Regarding questions asking respondents on their source of information about telemedicine, the majority 32.4% indicated that Books, Journals, Newspapers, Radio and TV are their source of information. Twenty three percent get information from interaction with colleagues and 2.3% from seminar/ workshop on telemedicine. Fourteen percent of the respondents indicated Internet as their source of information and 27.6% of the respondents get information from two or more of the options given as sources of information.

Table 5.4.4.1: Respondents Source of Information to Telemedicine by Hospital

Information Source	TAH	NH	Total	Percent
	Frequency	Frequency		
Interaction with colleagues	85	25	110	23.2%
Seminar/workshop	7	4	11	2.3%
From Internet	56	12	68	14.3%
From books, journals, newspapers, radio, and TV	124	30	154	32.4%
Two or more of the above options	89	42	131	27.6%
NR	1	-	1	.2%
Total	362	113	475	100%

5.4.5 Alternatives to Care Providers during Difficult Cases

For questions asking for alternatives that respondents supposed to do during difficult cases in their clinical work that they cannot deal with or beyond their capacity, 185 (51.5%) of TAH and 66 (58.4%) of NH respondents refer the case to another hospital where there is better physicians and resource and better treatment. Forty five (12.5%) of the respondents of TAH and 10 (8.8%) of NH prefer to give patients appointment to come back when better physician is available and 88 (24.2%) of TAH and 24 (21.2%) of NH prefer to read literature and/ or similar previous cases to handle the current case.

Table 5.4.5.1: Respondent's Preference to Alternatives during Difficult Cases

Alternatives	Hospital			
	Tikur Anbessa		Nekemete	
	Frequency	%	Frequency	%
Refer to another hospital	185	51.5%	66	58.4%
Give appointment to come back	45	12.5%	10	8.8%
Read Literature and Similar Cases	88	24.5%	24	21.2%
All of the above	41	11.4%	13	11.5%

5.4.6 Attending Tele-Consultation (TC) / Continuing Medical Education (CME)

Only 86 (18.4%) of the respondents have got the chance of attending tele-consultation and/or continuing medical education programs that were provided by their respective hospital telemedicine centre. While, 82.2% of Tikur Anbessa and 79.6% of Nekemete hospital care providers did not get the chance of attending the program.

Table 5.4.6.1 Respondents Participation in Tele-Consultation / CME by Hospital

Hospital	Attended Tele Consultation & CME					
	No		Yes		Total	
	Frequency	%	Frequency	%	Frequency	%
Tikur A.	291	82.2%	63	17.8%	354	100.0%
Nekemete	90	79.6%	23	20.4%	113	100.0%
Total	381	81.6%	86	18.4%	467	100.0%

5.4.7 Attitude/Perception towards Telemedicine

A list of six items that would help to assess attitude of respondents towards telemedicine were presented and given an option of 'Strongly Disagree'= 1, 'Disagree'= 2, 'Don't Know'= 3, 'Agree'= 4, and 'Strongly Agree' = 5 to indicate their feeling. For an item that assesses their interest to know about telemedicine, 50.4% of the Tikur Anbessa and 81.4% of NH respondents rated as they Strongly Agree. Regarding their perception about telemedicine's contribution to remote areas, 36.8% of TA and 70.8% of NH respondents were Strongly Agreed. When asking respondents training need and whether they would like to use the system or not, 50% of TA and 77% of NH were strongly agreed. On telemedicine's potential role in overcoming shortage of qualified health professionals to Ethiopian situation, 27.1% of TA and 64.6% of NH respondents were strongly agreed.

For item that assesses their feeling on telemedicine's role in improving clinical performance, 42.5% of TAH and 70.8% of NH participants rated Strongly Agree. On their perception of usefulness of ICT for the health sector in general, 54 % of the respondents of TAH and 50% of NH respondents rated Strongly Agree.

Table 5.4.7.1: Attitude / Perception of Respondents towards Telemedicine by Hospital

Attitude Variable	Rate	Hospital			
		Tikur Anbessa		Nekemete	
		Frequency	%	Frequency	%
I want to know about telemedicine	**Strongly Disagree**	**13**	**3.6%**	**1**	**.9%**
	Disagree	8	2.2%	-	-
	Don't Know	6	1.7%	-	-
	Agree	152	42.1%	20	17.7%
	Strongly Agree	182	50.4%	92	81.4%
Telemedicine help to deliver health care to remote areas	**Strongly Disagree**	**15**	**4.2%**	**-**	**-**
	Disagree	18	5.0%	6	5.3%
	Don't Know	30	8.3%	2	1.8%
	Agree	165	45.7%	25	22.1%
	Strongly Agree	133	36.8%	80	70.8%
I need training on telemedicine & willing to use	**Strongly Disagree**	**11**	**3.0%**	**2**	**1.8%**
	Disagree	8	2.2%	-	-
	Don't Know	12	3.3%	2	1.8%
	Agree	150	41.4%	22	19.5%
	Strongly Agree	181	50.0%	87	77.0%
Telemedicine overcome shortage of qualified health professionals	**Strongly Disagree**	**16**	**4.4%**	**2**	**1.8%**
	Disagree	51	14.1%	17	15.0%
	Don't Know	49	13.5%	3	2.7%
	Agree	148	40.9%	18	15.9%
	Strongly Agree	98	27.1%	73	64.6%
Telemedicine improves clinical performance	**Strongly Disagree**	**8**	**2.2%**	-	-
	Disagree	5	1.4%	1	.9%
	Don't Know	18	5.0%	2	1.8%
	Agree	177	48.9%	30	26.5%
	Strongly Agree	154	42.5%	80	70.8%
ICT in general is useful for health Sector of the country	**Strongly Disagree**	**2**	**.6%**	-	-
	Disagree	7	1.9%	-	-
	Don't Know	9	2.5%	1	.9%
	Agree	148	41.0%	54	49.1%
	Strongly Agree	195	54.0%	55	50.0%

5.4.8 Barriers to Telemedicine Development

Some of the barriers that respondents agreed up on as hindrances to telemedicine development includes resistance to new technology (Fixing on old ideas) among care providers, underdeveloped ICT infrastructure, high connection cost, poor cultural acceptability and the issue of privacy and security to patient information. The ratings of their feeling on these barriers are thus presented in the next table (Table 5.4.8.1).

Table 5.4.8.1: Perception of Respondents to Barrier of Telemedicine Development

Barriers to telemedicine	Strongly Disagree	%	Disagree	%	DK	%	Agree	%	Strongly Agree	%
Resistance to new Technology	39	8.2	33	7.0	73	15.4	219	46.3	109	23.0
Underdeveloped ICT infrastructure	14	2.9	44	9.3	31	6.5	288	60.6	98	20.6
High Connection Cost	23	4.9	95	20.1	109	23.0	151	31.9	95	20.1
Poor Cultural Acceptability by providers	62	13.1	89	18.8	78	16.5	162	34.2	83	17.5
Privacy & Security issues to patient information	31	6.5	73	15.4	76	16.0	176	37.1	119	25.1

5.4.9 Views on the Future of Telemedicine

Asking their opinions on the future of telemedicine, 300 (63.2%) of the respondents believe that telemedicine is a better in health care service and will become the future of health care delivery. One hundred five (22.1%) viewed telemedicine as a better in Health care service and become the future of health service but too far to achieve it, while 63 (13.3%) of respondents viewed that it is too far to achieve for us. The smallest number of respondents, 7 (1.5%) perceives telemedicine as it has no use at all.

Table 5.4.9.1: Frequency of Respondents View on Future of Telemedicine by Hospital

Views on Telemedicine	Hospital		Total	%
	TAH	NH		
	Frequency	Frequency		
A Better in Health Care & the Future of Health Service	203	97	300	63.2%
Too far to Achieve	57	6	63	13.3%
Better in health care & future of health service but too far to achieve	95	10	105	22.1%
No use at all	7	-	7	1.5%
Total	362	113	475	100.0%

5.4.10 Findings from Interview and Observation

Open ended questions was prepared to serve as a guide for interview with key informants to support some of the quantitative results presented so far and to assess the current status of the Telemedicine centers in terms of administration, manpower, equipment, level of technology, achievements and problems encountered. Some of the questions and answers were summarized and presented below. The key informants purposely selected were five. This includes hospital managers, head of the center, system analyst and the IT staff working at the TAH and NH telemedicine centers.

5.4.10.1 Status of the Telemedicine Centers (TAH & Nekemete Hospital)

A/ Tikur Anbessa Hospital TM Center

Objectives

The telemedicine unit of the faculty of medicine was established in 2006 on the basis of the context of an agreement made between the governments of Ethiopia and India who have made a significant financial and material contribution. The center was established with the following broad objectives:

- Creating awareness to the hospital staff, students and residents of the faculty on the new alternative telemedicine based health care delivery system;
- Organize and manage the existing Ethio-Indian and other telemedicine related programs of the faculty; and
- Search a means for new national, faculty wide and international initiative related to e-health application.

It has been designed to make available expert medical consultancy services in the field of Radiology, Cardiology, Pathology, Dermatology etc. from CARE Hospital Hyderabad, India, to Tikur Anbessa Hospital in Addis Ababa and Nekemete Hospital.

Activities undertaken by the unit includes

- Conducting live Continuing Medical Education (CME) sessions using teleconferencing
- Real time and store and forward based tele-consultation programs and
- Contributes to a national telemedicine strategy development

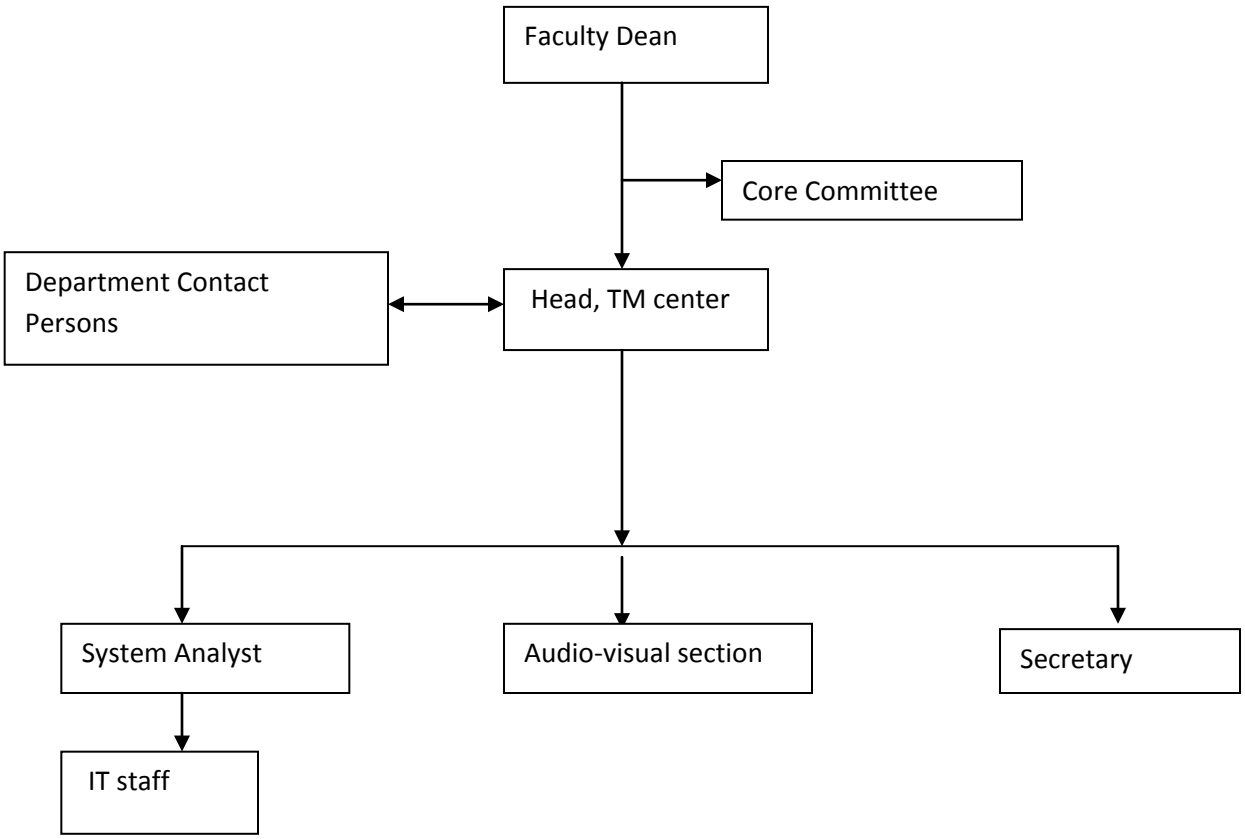
In TAH health care providers were assumed as having awareness regarding benefits and application of telemedicine. But the result of the study from the quantitative part does not support fully the idea of the interviewee.

During the set up of the center the FoM, AAU with MoH was attempting to create awareness of telemedicine and its benefits to concerned government and non-government organizations, health professionals and students by organizing workshop and using brochures and notice. Health care providers attending such kind of awareness creation activities were very limited. Furthermore at meetings of the academic commission of FoM discussions related to issues of telemedicine were undertaken. Representatives from each department were selected and appropriate training was provided.

Regarding training, those interviewed agreed that training is one part of learning and if possible it should be provided to care providers particularly on telemedicine systems and services, applications, benefits and other technological issues associated with it. This view is fully supported by the respondents of the questionnaire to this survey in which, the majority agreed and strongly agreed for an item requesting to rate their training needs.

The Structure of the Telemedicine Center (TAH)

Fig 1. Organizational structure of the telemedicine center of TAH/FOM



Human Resource

The telemedicine center of TAH has one staff as head of the center, a secretary, one IT staff and a committee of 5 members from the Ethiopian side. From the Indian side, there is 3 staff who works as system analyst and manager of the project.

Infrastructure & Equipments

Based on the agreement made between the two governments, the Ethiopian government provided a communication link of 1MB between transmission centers at Addis Ababa to the Tikur Anbessa Hospital. Furthermore, Connectivity cost that amounts 50,000 ETB on average per

month agreed to be the cost from the Ethiopian side. From the side of the Indian government, the agreement states a contribution of funds to cover the cost of a tele-education and tele-medicine pilot project in Ethiopia. In addition to this, TCIL a wholly owned subsidiary of Government of India was appointed by the Indians for implementing the project.

An optical-fiber based telemedicine network was set up by TCIL (Tele communication consultants India Limited) at Tikur Anbessa hospital and a remote location, Nekemete hospital. In addition to this the consultants has contributed in the provision of maintenance service, in the training of technicians, provision of the required IPLC from India to Addis Ababa, provision of the necessary equipment and in contacting the experts from CARE hospital for the TC/CME program.

An Interview made with an IT staff and personal observation of the center revealed the availability of the following equipment:

Networking Equipment which includes:

- Tele-Medicine Server, Hardware & Software along with storage,
- PCs with web cameras, Registration PCs, PCs for Medical Equipment
- Multi student classroom systems equipment such as Multimedia PCs, LCD Projector, camera, microphone and headphone etc.
- CME Application Client Software

Medical Equipments which includes:

- X-Ray PC
- Digital X-Ray Machine,
- ECG Machine
- Digital Microscope
- Blood pressure instrument
- Glucometer
- Color Doppler Ultra-Sound Machine,
- Urine Analyzer and Hot Air Oven Equipment etc.

With regard to the equipments level of technology it was argued that it is high tech and similar to those equipments used in other developed countries for the same services. The current network infrastructure as well is relatively good.

Network Connectivity and set up of the Telemedicine unit:

The architecture of the telemedicine and CME system of the TAH is based on the widely accepted network protocols for the interconnectivity and Client - Server model.

The currently operational TM/TE program of the faculty is the Ethio-Indian pilot TM project. The project is part of the pan African e-network project, where this is the first and the pilot phase. CARE hospital is connected to VSNL facilities in New Delhi through 2mbs-leased line. The interactive educational and medical discussion from CARE and other hospital are transmitted to Ethiopia on sub marine cable based on 2mbps international private leased circuit (IPLS) between India and Ethiopia via Djibouti.

One of the interviewee that is considered as local leader and champion believed that the activities so far completed are unsatisfactory. He mentioned that, from 2006 to 2008 only 63 TC and CME sessions were undertaken and this makes **t**he mean number of session (both TM and TE) per month to be 2.6 (63 sessions /24 month). The primary objective of the pilot project as indicated in the project document of the pilot project was two sessions per day (one TC and one CME). In view of the intended objective, the opinion of those interviewed and the cost involved in the project, the rate of utilization is quite low. As main cause for such low level of utilization, failure or poor connectivity and associated dissatisfaction of users were mentioned.

During the time of this study the real Pan African e-network program has started and on average 40 to 50 CME programs were being conducted per month.

The telemedicine program of the TAH is the only sustained one, but efficiency and effectiveness were not attributable to its sustenance. The major reasons accounted for its sustenance, among others, were its donor-driven nature, involvement of the government, MoH and ETC, and existence of local champions/ leader.

B/ The Nekemete Hospital TM Center

The telemedicine center at Nekemete hospital was established in 2006 at the same period as of the Tikur Anbessa. Its infrastructural set up is exactly the same as the one in Tikur Anbessa hospital in terms of IT, medical equipment, and network structure and over all arrangement

The administrative structure of the hospital does not show where the center is. According to the manager of the hospital, at its establishment, a representative who is responsible for the overall activities and who has some training was assigned to the center on a part-time basis, but after the person left the hospital the center is forced to closure.

According to the hospital manager, the hospital had never assigned a budget to run the activities of center or to employ an IT staff for its supervision due to financial constraints. Furthermore, the connectivity cost asked by the telecommunication corporation even to cover one month's expense is not affordable for the hospital and the regional health bureau unfortunately has no mandate to interfere because of the direct involvement of the Federal MoH on the establishment of the Telemedicine center.

According to the Manager of the Nekemete Hospital, the center is well equipped with high tech equipments donated by the government of India. For its short lived period of operation the cost was covered by the agreement made between the two governments. It was reported that health workers are not as such aware of the benefits as well as clinical application areas. This argument is partially supported by the findings of this study which identifies some of the respondents as aware of the benefits and application areas of telemedicine and the remaining as unaware.

As a weakness of the hospital it was mentioned that no awareness training for the health care providers about telemedicine potential benefits or clinical application was conducted. This is for the most part because of lack of trained personnel in the area.

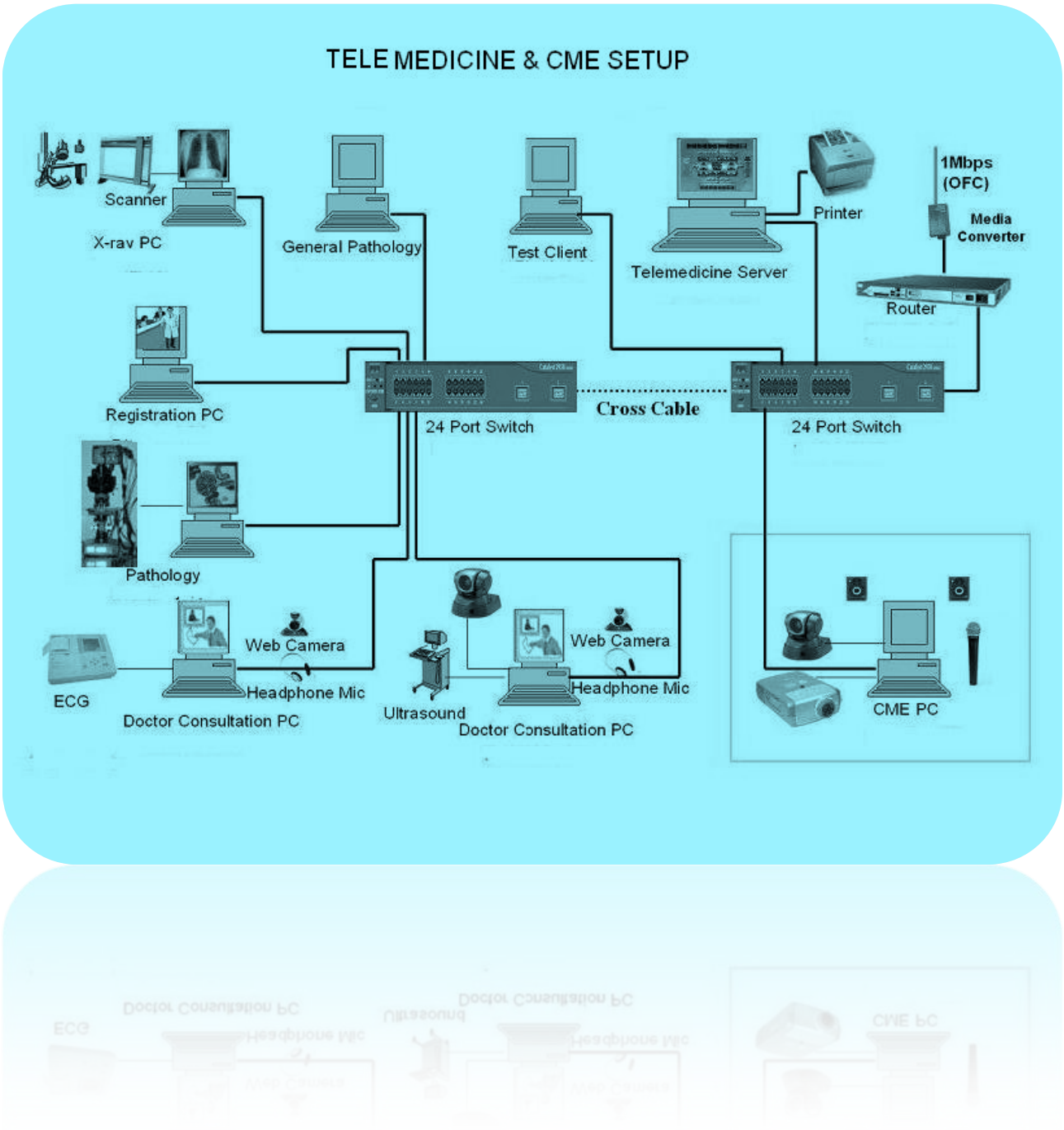
Telemedicine program designed at Nekemete hospital which was assumed to serve most of the rural parts by connecting it with TAH has failed to sustain on its inception due to lack of commitment from the hospitals side and non availability of trained personnel in Telemedicine. Lack of awareness and interest, shortage of staff trained in IT, infrastructure and connection cost were also mentioned as contributing factors for the failure of the program.

C/ Problems Identified

The following major problems were identified from the observations made on the centers as well as the response from the interviewee.

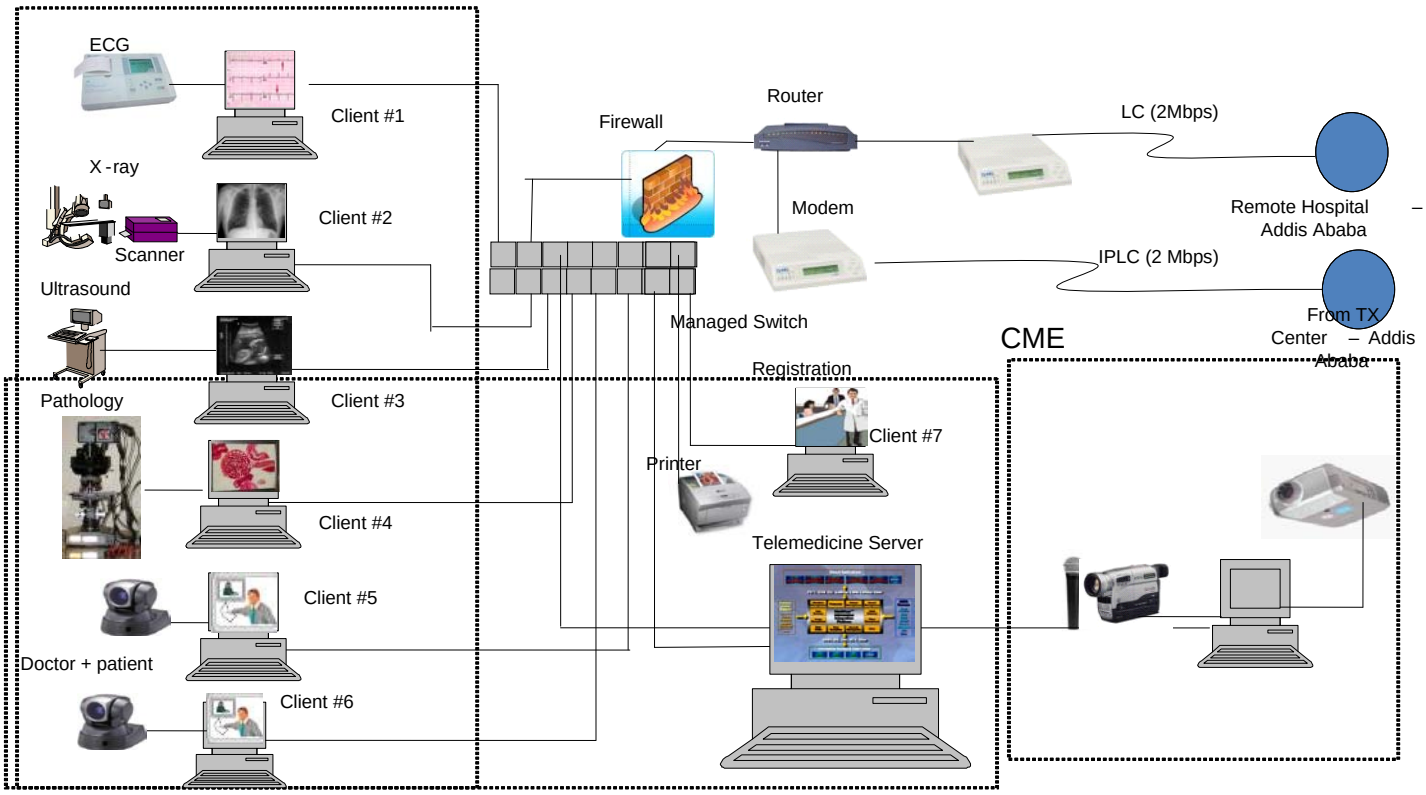
- Lack of Awareness reported in both hospitals
- Resistance to this new technology exists in TAH
- Low level of effort to create awareness
- Failure of connection and its associated dissatisfaction of users,
- Financial Constraints,
- Lack of Management commitment,
- Government imposition of the program,
- Unfavourable attitude of the concerned RHB, and
- Shortage of Trained Manpower.

Fig 2. Telemedicine and CME set up of the Telemedicine Unit of TAH



Source: TCIL. PAN-AFRICAN e-Network. Available at www.tcil-india.com

Fig.3 Telemedicine Local Connectivity Set Up at TAH



Source: TCIL. PAN-AFRICAN e-Network. Available at www.tcil-india.com

CHAPTER SIX

DISCUSSION

As can be seen from the result of this survey a high proportion of females were represented within the sample and this was influenced in particular by the gender configuration of the nursing profession who are well represented within the sample. Nurses comprised the largest single group included in the survey with Anesthetists the smallest group. With regard to ICT exposure, the largest proportions of respondents are computer literate who claim to have an introductory level ICT training. This again belongs to the younger age group of under 30 who can have a chance of developing their skill through time.

Some comparable studies were done to assess knowledge level of health care providers towards telemedicine systems and services. For instance, Gatit (2008), surveyed Libyan Physicians knowledge and found out that their knowledge level was extremely low. Another study made by Banjoko (2008) that assess Nigerian Health care providers knowledge regarding telemedicine disclosed that 41.5% of the respondents as having poor knowledge of telemedicine. Furthermore, a study that was done in Pakistan by Shoaib (2009), exhibited a lack of sufficient knowledge among health professionals. In our case, this study revealed that 32.6% of TAH and 18.6% of NH respondents have good knowledge and 48% of TAH and 73.5% of NH respondents have very good knowledge towards telemedicine systems and services.

Various literatures identified standard method of telemedicine delivery systems as store and forward and real-time or Asynchronous and Synchronous approach (Singh, 2006; Dasgupta, 2008). This study revealed that store and forward method of service provision is the most widely used and a low cost approach in Tikur Anbessa Hospital telemedicine center. Among the surveyed care providers, 58.4% have knowledge on this method of service delivery.

Awareness levels to benefits of telemedicine were evaluated by different authors. Annual Review of Public Health (2000) Hjelm (2005), Hein (2009) argued that telemedicine technology favors not only the end users who are capable to obtain health care more efficiently but also the health professionals who make more efficient their attempts to help extended number of patients.

It was also identified that telemedicine technology can improve access and convenience to health care in remote areas, improve quality of health care, reduce health care cost and above all ensure safety and security of patient information (Hjelm, 2005). In this current survey, for a question assessing respondents awareness level to telemedicine benefits, almost half of the respondents (49.5%) were aware of the benefits in terms of improving quality of care, access and convenience, cost reduction and ensuring safety and security of patient information. Again, 24.4% of the respondents are aware of its benefits only in terms of improving quality of care. Generally from the result of this survey it can be assumed that awareness level of care providers to the potential benefits of telemedicine is relatively at a low level.

With regard to Telemedicine's clinical application areas various studies have identified that telemedicine systems has been useful in almost all fields of clinical medicine ranging from radiology and dermatology to surgery and psychiatry (Krupinsk, 2002; Field, 1996). The result of this survey revealed that 52.6% of the surveyed populations were aware of telemedicine applications to almost all fields of clinical medicine. Whereas, the remaining 47.4% of the respondents, still unaware of application areas identifying in their response only one or two of the given items.

In assessing willingness of health care providers to use telemedicine system in day to day clinical practice, this survey disclosed given that appropriate training on telemedicine is provided 50% of TAH and 77% of NH respondents are willing and happy to use the system.

As can be seen from day to day clinical practice there are usual methods of handling difficult cases that became beyond the capacity of the care provider. Literatures identified that in such cases, referring to another hospital, consulting books or looking back to similar previous cases, appointment for another time could be a solution. In this survey 52.8% of the respondents prefer to refer the case to another hospital where there is better professionals and facilities. Corresponding to this issue their knowledge was again assessed with regard to telemedicine's role in reducing unnecessary referral, and fortunately it is favorably answered by 88% and 100% of the respondents of TAH and NH respectively. Thus if the technology happens to flourish in our hospitals referring seriously sick patients from remote areas to large cities as that been the case to many Ethiopian villagers who sought clinical aid, become history.

Regarding the barriers that faces telemedicine implementation in developed countries literatures identified that organizational barriers that include uncommitted leaders or lack of support from executive management team, and lack of accessibility to the facilities that have the equipment, unclear division of responsibility among the profession, lack of educated IT staff, mental barriers, unwillingness to change, technical barriers, privacy and confidentiality issues are the major ones (ITHS, 2000; WITSA, 2006).

Coming to this survey, exploration of respondents' attitude on factors that hinder the development of the telemedicine service and contribute to low level of utilization of the existing telemedicine facilities, elements such as resistance to new technology by health care professionals, underdeveloped ICT infrastructure, connectivity cost, poor culture, and privacy and security issues to patient information were perceived by the majority of respondents as barriers to telemedicine implementation and development. Professionals' resistance to easily catch up with new technology is agreed and strongly agreed up on by 69.3% of the respondents. Underdeveloped ICT infrastructure is a barrier to 81.2% of the respondents that can be explained by repeated failure in connection. High connectivity cost for 52% of the respondents and privacy and security of patient information is firmly believed to be a barrier for 62.2% of the participants.

This underscores firstly, the need for wide scale awareness creation training program on telemedicine to the health care providers as well as the general public. Secondly, with regard to infrastructural and high cost problems the government as well as ETC has the full burden to work hard in improving the network, avoid band width problems and if possible arrange for low cost access to technology.

Telemedicine relies heavily on the transmission of data across telecommunication networks and secure network access and data transmission is critical to the confidentiality and privacy of personal medical data. The protection of privacy and confidentiality interests will require those who work in the area of IT and health care providers to work together to ensure that information will only be shared among authorized personnel directly associated with the delivery of patient services. Protecting security interests, on the other hand, mandates that information will be protected from unwanted loss, modification and dissemination. This can be addressed by the establishment of firewalls or other practices that limit health care providers' ability to access

information based up on his/her job specific responsibilities. The belief and values that people have ingrained in themselves by their cultural context significantly affects their thinking and perspectives, and hence their approach to using technology. Cultural issues need to be addressed in terms of appropriate and relevant technology or developing user friendly technology and information sharing cultures among the health care professionals should also be improved.

In this study health care providers firmly believe that telemedicine is a better in health care provision and will come to be the future of the health sector of the country, an idea, which is supported by the majority of the participants of the survey.

CHAPTER SEVEN

CONCLUSION

This survey has covered a range of health care providers across profession and all age groups. The findings of the study have clear implications for intervention in a number of key areas for ongoing implementation of telemedicine.

The study disclosed that the majority of the respondents of both hospitals are knowledgeable towards basic telemedicine systems and services. The majority who claims to have introductory level computer training were believed to be computer literate. The majority again have favorable attitude towards the system. On the other hand their awareness to the potential benefits of telemedicine is relatively found at a lower level.

The result further revealed that only half of the surveyed populations were aware of telemedicine applications to almost all fields of specialty in clinical medicine, whereas, the remaining half of the respondents found to be unaware of these application areas. These suggests out the existence of knowledge gap among respondents with regard to benefits and clinical applications of telemedicine. It further indicates the need for wide scale promotion to raise level of awareness through seminar, short term training, brochures and pamphlets, broadcasting media or any other appropriate means. This is because the most critical component of telemedicine is the end users – particularly health care providers.

Regarding willingness of care providers in using the system in day to day health care practice, the study disclosed that, 50% of TAH and 75% of NH survey participants showed their willingness given that appropriate training is provided and barriers minimized. Nevertheless, the identified obstacles and barriers need further research and investigation.

The status of the telemedicine center of TAH, as observed by the investigator and supported by interview participants is good, but at this initial phase its level of utilization is low. It has many favorable sides and hopefully will contribute a drop to the sector as part of the Pan African e-health project.

Since TM is a better in health care provision and will come to be the future of the health sector of the country, emphasis should be rest on solving the identified barriers and obstacles. Ultimately the future of telemedicine will depend on human factor, economics and technology.

CHAPTER EIGHT

RECOMMENDATIONS

This study has some important implications for practice and could provide some directions for researchers and policy makers working in the area of health care promotion by applying ICT in general and Telemedicine in particular.

The following points could be forwarded as recommendation:

- Appropriate training should be provided for care providers on telemedicine systems, new technologies, benefits, and applications in order to raise their level of awareness.
- Those concerned should provide an immediate solution for solving the problem encountered at pilot project areas especially at the Nekemete Hospital Telemedicine Center and make use of the potentials of the existing resources.
- A plan is needed to ensure efficient use of the resources and efforts and to promote practical expectations of telemedicine's role in the health care system.
- The Government and ETC has to work hard to improve the level of the existing infrastructure.
- Concerned bodies should look for low cost telemedicine systems and equipments appropriate for the country.
- Wide scale research should be done to investigate the feasibility and sustainability of telemedicine in Ethiopia.

Strength and Limitation of the Study

Doing research in telemedicine, which is a new field of study and new technology for us could be considered as the strength of the study. The research can serve as a baseline for other researchers who would like to do investigations in the field. The findings of the study can help policy makers to make an intervention for ongoing implementation of similar telemedicine programs.

Due to time and financial constraints the study is limited to assess care providers working only in the two hospitals. Besides, not including the teaching staff of Tikur Anbessa Hospital and patients in the survey is considered as a limitation.

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Annex

Annex 1

Information Sheet

Title of the Research

Knowledge and Perception of Health professionals towards Telemedicine Application and Benefits: Survey from Black Lion & Nekemete Hospitals

Name of Investigator

Alemayehu Bisrat Gebre

Back ground of the Study

This study will be conducted by a postgraduate student from AAU, Faculty of Medicine &Informatics Joint program. The purpose of this study is to have a better understanding of the level of knowledge and perception of health professionals towards telemedicine benefits and applications and to assess the current status of the telemedicine unit of the hospitals. Thus it will make some recommendations that may guide health decision makers.

Benefits and Harms

There is no harm by participating in this study. But the health sector as a whole may benefit from the result of the study.

Confidentiality

You will participate in the study to fill the questioner that is designed to assess your knowledge level and perception of telemedicine practice. Your response is made anonymous so that you can freely express your opinion. All your answers will be kept strictly confidential.

Dissemination

The result of this study will be presented to the University Community and a copy may be kept at the Faculty of Medicine, Faculty of Informatics, and Addis Ababa University Libraries.

Contact Person

Alemayehu Bisrat

A Postgraduate student,

Department of Health Informatics, Addis Ababa University

Tel. Mobile: - 0911 155987 Office: - 011 1239786

Email: - alemayehbo@yahoo.com

Thank you for your Time

Annex 2 Questionnaire

Questionnaire on Basic Telemedicine Knowledge and Perception for Health Professionals

Part A: Personal Information

1. Respondent Institution/Hospital _____
2. Professional Category:
   1. Specialist 2. GP 3. Nurse 4. Pharmacist 5. Lab. Technician
   6. HO 7. Radiographer 8. Physiotherapist 9. Midwives
   10. Anesthetist

   2.1 If Specialist, Type of specialty _____
3. Age Range 1. < 30 2. 30 – 39 3. 40 – 49 4. 50 and above
4. Sex 1. F 2. M
5. Year of service 1. < 5 2. 5 – 9 3. 10 – 14 4. 15 – 19 5. 20 and above
6. Your Nationality 1. Ethiopian 2. Non-Ethiopian
7. Qualification 0. PHD 1. MSC 2. BSC 3. Diploma 4. Certificate
   5. Other (Specify) _____

Part B: Exposure to Information Communication Technology (ICT)

1. Have you got any training in computer or information technology?
   1.1 I never attended training in ICT area
   1.2 Just an introductory level
   1.3 I have a certificate in ICT area
   1.4 I have a Diploma
   1.5 BA/BSC in ICT area
   1.6 Other, Specify _____

2. Do you use computers in your work or outside your work? 0. No 1. Yes

   2.1 If yes what are the tasks you perform with computers?
   2.1.1 For word processing, database management etc.
   2.1.2 For Internet access
   2.1.3 Entertainment
   2.1.4. Two or more of the options given

3. How often do you use Internet?

   3.1. Everyday 3.2 Every week 3.3 Every month 3.4 Less than once in a month

   3.5 Every other day 3.6 Not at all 3.7 Twice a week

4. Which Internet application do you usually use?

4.1 Web browsing
4.2 E-mail
4.3 Searching Electronic documents
4.4 Two or more of the options given above

5. Have you ever visited web sites related to the medical field in the Internet?

0. No 1. Yes

Part C: Knowledge on Basic Telemedicine Systems and Services

No.	Item	Yes	No
1	There are alternative ways of patient care other than conventional doctor- patient relation	1	0
2	Telemedicine means providing health care from distance	1	0
3	Telemedicine service can reduce unnecessary referrals and minimize cost	1	0
4	Computer technology, Telecommunication technology & Health care technology can be used in Telemedicine practice	1	0
5	Store & Forward method is an approach to telemedicine service provision	1	0
6	Real Time live conference method is an approach to telemedicine service provision	1	0
7	Using Telemedicine will Improve Clinical work	1	0
8	Telemedicine is relevant to educate patients and health professionals on managing health problems	1	0

Part D: Telemedicine Clinical Application areas and Benefits

1. Which of the following do you think are the clinical applications of telemedicine?

1.1 Dermatology
1.2 Radiology
1.3 Cardiology
1.4 Ophthalmology
1.5 Physiology
1.6 All of the above
1.7 Two or more of the above options
1.8 Other (Specify)
1.9 I don't know

2. Which of the following do you think are the benefits of telemedicine?

2.1 Improve quality of care
2.2 Improve Access and convenience
2.3 Reduced cost

2.4 Reduce Isolation
2.5 Ensure Safety and security of patient information
2.6 All of the above
2.7 Two or more of the above options
2.8 None of the above

3. What is your source of information about telemedicine?

3.1 Interaction with colleague
3.2 Seminar/Workshop on telemedicine
3.3 Studies from the Internet
3.4 Books, journals, Newspapers, Radio, TV, etc. 3.5 Two or more of the above options

4. What are the alternatives that you supposed to do during a difficult **case** in your work that you cannot deal with?

4.1 Send the patient for better treatment to another hospital

4.2 Give appointment to the patient to come back another time when there will be a better physician

4.3 Refer medical literature and/or similar previous cases

4.4 All of the above

5. I have attended Tele-consultation and/ or Continuing Medical Education (CME) sessions with telemedicine unit of my hospital. **1. Yes** **0. No**

Part E: Attitude/ Perception towards Telemedicine

(Circle the number that represents how you feel about telemedicine)

No.	**Item**	**Strongly Disagree**	**Disagree**	**Don't Know**	**Agree**	**Strongly Agree**
1	I want to know about telemedicine	1	2	3	4	5
2	Telemedicine is much more useful to serve remote areas	1	2	3	4	5
3	I need training on telemedicine to use the system	1	2	3	4	5
4	Telemedicine would overcome shortage of qualified health personnel	1	2	3	4	5
5	Telemedicine improve my clinical performance	1	2	3	4	5
6	ICT is useful for the health sector	1	2	3	4	5

Part F: Attitude towards Barriers to telemedicine development (Circle the number that represents how you feel about telemedicine)

No.	Item	Strongly Disagree	Disagree	Don't Know	Agree	Strongly Agree
7	Resistance to new technology is a **barrier** to telemedicine practice in my hospital and resulted underutilization of the system	1	2	3	4	5
8	Underdeveloped ICT infrastructure is **barrier** to Telemedicine development	1	2	3	4	5
9	High connection cost is **barrier**	1	2	3	4	5
10	Poor cultural acceptability by Health professionals is **barrier**	1	2	3	4	5
11	Privacy and security issues of patient information are **barriers**	1	2	3	4	5

12. Your View/ Conclusion about the future of Telemedicine. (You can choose more than one item)

12.1 A better in health care service and will Become the future of health service
12.2 Too far to achieve
12.3 A better in health care service and will Become the future of health service but too far to achieve it
12.4 No use at all

Annex 3

Statement of Voluntary Consent

For Interview participants in the study described below

Date: March, 2010

Research Title: Knowledge and Perception of Health Professionals towards Telemedicine Application & Benefits: Survey from Black Lion & Nekemete Hospital

Investigator: Alemayehu Bisrat Gebre

(MSC Student, Health Informatics Department, Addis Ababa University).

Contact Information: Tel. 011 1239786 (Office)

Cell Phone: O911 155987 E-mail: alemayehbo@yahoo.com

Purpose of the Study: The purpose of this study is to have a better understanding of the level of knowledge and perception of health care professionals towards telemedicine and to assess the current status of the telemedicine units of the two hospitals.

As a volunteer participant in the above mentioned research, I understand that I will be interviewed with an interview guide that will ask questions related to telemedicine. The Interview typically takes about 30 minutes to complete. I also understand that the information I provide will be used exclusively for this project and will in no way be associated with my name, address or any other identifiable information. I understand that I can also leave the study at any time.

As a participant, I am aware that the responses I provide may assist health decision makers in future efforts to improve telemedicine practice at this hospital and perhaps other hospitals across the country.

By signing below, I state that I have read this consent form in its entirety and that all of my questions have been answered.

Participant Signature _____ **Date** _____

Witness Signature _____ **Date** _____

Thank you for your Time

Annex 4

Interview Guide for Telemedicine Center Coordinator

1. What was the objective of establishing the telemedicine center?
2. Is the objective achieved so far?
3. Number of trained staff
4. Level of the technology (Equipment)
5. How is the telecommunication Infrastructure?
6. Estimate the annual cost of the project and from what source the cost is covered?
7. Is the project cost effective?
8. Which telemedicine clinical application is widely used in the center?
9. Awareness of health care providers on the benefits & application of telemedicine
10. Is there any resistance to the technology from health care providers?
11. Have you ever conducted telemedicine awareness training/workshop for the hospital health care providers? (or by any concerned body)
12. Do you think that further training on telemedicine is needed for health care providers?
13. What problems did you encounter in providing telemedicine service?
14. Is the program successful or failed? How successful/ Why failure?
15. Any suggestion for improvement?

Annex 5

Interview Guide for Hospital Directors

1. What was the objective of establishing the telemedicine center?
2. Is the objective achieved so far?
3. Number of trained staff
4. Level of the technology (Equipment)
5. How is the telecommunication Infrastructure?
6. Estimate the annual cost of the project and from what source the cost is covered?
7. Is the project cost effective?
8. Which telemedicine application is widely used in the center?
9. Awareness of health care providers on the benefits & application of telemedicine
10. Is there any resistance to the technology from health care providers?
11. Have you ever conducted telemedicine awareness training/workshop for the hospital health care providers? (or by any concerned body)
12. Do you think that further training on telemedicine is needed for health care providers?
13. What problems did you encounter in providing telemedicine service?
14. Is the program successful or failed? How successful/ Why failure?
15. Any suggestion for improvement?

Annex 6

Reliability test of Cronbach's Alpha for the Questionnaire Items

Cronbach's Alpha is a model of internal consistency based on the average inter-item correlation.

Reliability Statistics

Cronbach's Alpha	N of Items
.739	19

Item Statistics

	Mean	Std. Deviation	N
There is an Alternative Patient Care	.71	.452	458
Telemedicine means health care from distance	.90	.301	458
Telemedicine Reduce Unnecessary referral	.91	.283	458
Computer, Telecommunication & Health Care Technologies are used in Telemedicine	.90	.307	458
Store &Forward is an Approach in Telemedicine	.62	.486	458
Real Time is an Approach in Telemedicine	.66	.473	458
Telemedicine Improve Clinical Practice	.85	.356	458
Telemedicine has health Educational Value	.82	.382	458
I want To Know about Telemedicine	4.44	.863	458
Resistance to new Technology is Barrier	3.68	1.140	458
Telemedicine Help To Deliver HealthCare To Remote Areas	4.18	.989	458
I Need Training On Telemedicine	4.41	.866	458
Telemedicine Overcome Shortage Of Qualified Health Professionals	3.85	1.172	458
Underdeveloped ICT Infrastructure Is a Barrier to telemedicine	3.86	.948	458
High Connection Cost Is a Barrier to telemedicine	3.43	1.153	458
Poor Cultural Acceptability Is a Barrier to Telemedicine	3.26	1.293	458
Privacy & Security Issues To Patient Inform Is a Barrier	3.59	1.195	458
Telemedicine Improve Clinical Performance	4.36	.779	458
ICT in general is Useful for the Health Sector	4.47	.658	458