The Role of Telemedicine in the Management of Stroke Patients and Knowledge Sharing among Health Care Providers in Afghanistan

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Abstract

Focusing on the potential use of telemedicine among other efforts for better treatment of stroke patients, this study explored the role of telemedicine in the management of stroke patients and knowledge sharing among health care providers in Afghanistan. To this end, fourteen semi-structured interviews were conducted with physicians, specialists, neurologists, and decision makers from the Afghan Ministry of Public Health (MoPH). Actor-network and diffusion of innovations theories provided a theoretical framework for this exploratory qualitative study. The study was intended: 1) to find out about the major challenges and problems associated with managing stroke patients in Afghanistan; 2) to explore the perceptions of Afghan health professionals about the application of telemedicine as a means of improving the delivery of health services for stroke patients in Afghanistan; and 3) to understand the perceived barriers to knowledge sharing and to ascertain the potential role of telemedicine in knowledge sharing among health care providers in Afghanistan. The findings of this study demonstrated that almost all of the participants were optimistic about the potential positive role telemedicine could play in the management of stroke patients and knowledge sharing among health care providers in Afghanistan. Some important existing organisational, socio-economic, geographical, security, and cultural barriers to the management of stroke patients and knowledge sharing among health care providers in Afghanistan were revealed. To the best knowledge of the researcher, there has been no study of this kind conducted in Afghanistan yet; thus, the findings of this study will likely contribute to the development of health communication in the context of Afghanistan, and could likely be used as a resource for future research about the applications of telemedicine in various medical specialities.

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Chapter One: Introduction

Developments in Information and Communication Technology (ICT) and its integration into the health sector have changed and transformed medical practices, resulting in improvements in the delivery and efficacy of health care information and services (Organisation for Economic Co-operation and Development [OECD], 2010). In other words, ICT seems to be playing an important role in the medical field, and ongoing advances in ICT are changing the health care system from "industrial age medicine" to "information age health care," (Smith, 1997, p. 1496) in which self-care has been prioritized over professional care and health care providers not only treat diseases, but they also promote health care by using ICT (Lupianez-Villanueva, Hardey, Torrent, & Fiscapal, 2010; Smith, 1997). In addition, "health technologies are used at every level of the health care system, from the simplest to the most advanced, they form the backbone of the services medicine can offer in the prevention, diagnosis and treatment of illness and disease" (WHO, 2003. p.2).

The evolution of ICT has contributed to the development of telemedicine, which is the "use of electronic information and communications technology to provide and support health care when distance separates the participants" (Field, 1996, p. 1). Telemedicine has proven to be a useful medium for a better access to health care facilities in rural areas as well as in emergency situations; for example, telemedicine can be applied as an effective tool for providing specialized emergency health care services for both man-made and natural disaster-related emergencies, such as earthquakes, volcano eruptions, fires, explosions, and so on (Potin et al., 2009; Wang et al., 2009). For instance, the National Aeronautics and Space Administration (NASA) provided emergency health care services through telemedicine to the victims of earthquakes in Mexico City in 1985 and in Armenia in 1988 (Garshnek & Burkle, 1999; Nicogossian, Pober, & Roy, 2004). In addition, Wang et al. (2009) state

that “applications of telemedicine to disaster response began in the mid-1980s for natural disasters such as earthquakes, tsunamis, and hurricanes and for “staged” disasters in experiments and exercises” (p. 2809).

Furthermore, telemedicine is a good educational medium that paves the way for continuing education or medical training for health care providers in isolated rural areas, who may not have the opportunity or time to travel to a big city and participate in medical training (Brown, 2005). In this way, the use of telemedicine contributes to knowledge sharing among specialists, physicians, and other health care providers, which can add to organizational strength and capacity building. As Hojabri, Borousan, and Manifi (2011) state, “information technology fosters collaborations among multiple specialists in several locations via telecommunication, and also provides foundations for organizational learning and knowledge sharing" (p.1604).

Moreover, since time is an important factor and an integral part of the treatment for stroke patients, the use of telemedicine will probably be effective in the evaluation, management and treatment of stroke patients, especially in the distant and rural areas of Afghanistan, where access to specialized health care services is very limited. In addition, through the application of telemedicine in Afghanistan, knowledge management and sharing among physicians, specialists, neurologists, and other health care providers may be encouraged and fostered. As Ashley (2002) mentions that there are several key advantages of telemedicine applications in health care services, including the elimination of physical distances among providers and patients; improvement in the quality of health care services by facilitating medical training and education; and improving skills and expertise of health practitioners across distances. Thus, this study intends to ascertain the potential role of telemedicine in

the management of stroke patients and knowledge sharing among health care providers in Afghanistan.

This chapter will first discuss Afghanistan's health context, then it will highlight some of the achievements of the Afghan telecommunication sector in the post-Taliban era. Subsequently, it will elaborate on the statement of the problem and purpose of the study, rationale for the study, and overview of the thesis.

Health Context of Afghanistan

More than three decades of war and civil unrest have devastated Afghanistan by either destroying or looting most of the infrastructure (Romanowski, McCarthy, & Mitchell, 2007). Like other socio-economic sectors, the health sector was also severally affected by prolonged years of internal conflict and war (Dale, 2009; Oxfam, 2009). Therefore, the Ministry of Public Health (MoPH) did not have the managerial ability due to a lack of both adequate financial sources and qualified personnel. This inability paved the way for non-governmental organisations (NGOs) to provide fragmented and uncoordinated health services with insignificant and minimum supervision and controls from the MoPH (Loevinsohn & Sayed, 2008; MoPH, 2011). Therefore, the majority of the rural community had no access to primary health care services (Save the Children, 2011; Waldman, Strong, & Wali, 2006). Luckily, after the overthrow of the Taliban regime in late 2001, Afghans have witnessed some progress in various fields including health, telecommunication, rural development, and education (World Bank, 20012).

However, the health care service conditions in Afghanistan are still among some of the worst in the world; some progress has been made in the last decade in terms of expanding primary health care services to rural people through the implementation of Basic Package of Health Services (BPHS)[1] across the country. Meanwhile, in the last decade the access to and quality of health care services have improved through close coordination and collaboration among the MoPH and some interested groups including international donors and NGOs. For instance, the Afghan population's access to health care facilities within two hours of walking distance has increased from 9 percent in 2000 to 57.4 percent in 2010 (WHO, 2012). As a result of better access to health care facilities and improvements made in the overall quality of health care services, life expectancy for both men and women has increased by 20 percent over the last 10 years (World Bank, 2012; WHO, 2012). Accordingly, these improvements have resulted in a declining infant mortality rate across the country. According to the World Bank (2012), "infant and under-5 mortality in 2010 has declined to 77 and 97 per 1,000 live births respectively, from 111 and 161 per 1,000 live births in 2008" (para.7).

Afghanistan's Health care system can be better explained through the concepts of BPHS and Essential Package of Hospital Services (EPHS).[2] Through these concepts, BPHS and EPHS, health services are provided by non-governmental organisations (NGOs), which are contracted by the MoPH, in which the MoPH mostly plays a stewardship role. Each contracted NGO works in collaboration with the MoPH and covers a province or several districts within a province. These

[1] BPHS serves as the cornerstone of Afghanistan's healthcare system and ensures that primary healthcare services are made accessible to all Afghans. WHO in collaboration with MoPH took the initiative to develop BPHS for Afghanistan in 2002, and was largely supported by UNICEF, USIAD, UNFPA, MSH and several other international NGOs (MoPH, 2003; MoPH, 2010).

[2] EPHS is an integral part of the healthcare system in Afghanistan. In 2005 MoPH developed EPHS to standardized hospitals' clinical and administrative services and improve quality of hospital care at various levels in Afghanistan (MOPH, 2005).

contracted NGOs are funded by international donors[3] (Acera, Iskyan, Qureshe, & Sharma, 2009; USAID, 2012).

Basic package of health services and essential package of hospital services. The BPHS is intended to improve the Afghan health care system through the provision of equitable, accessible, and sustainable primary health care services to the people of Afghanistan, especially to women and children in underserved and remote areas (MoPH, 2010). The Afghan Ministry of Public Health has had some tangible achievements since the implementation of the BPHS in 2005. BPHS has increased the availability of health centers and has improved the accessibility and quality of health care services throughout the country. BPHS has been implemented in several types of health facilities ranging from a community outreach to a district hospital (MoPH, 2005; MoPH 2010).

According to the World Health Organization (2006) and the Afghan Ministry of Public Health (2005), BPHS provides standardized primary health care services in four levels. First, Health Post (HP), which is staffed by one female and one male Community Health Workers (CHWs) who serve 100-150 families. HP provides very limited basic medical care, which include diagnosis and treatment of malaria, diarrheal diseases, and acute respiratory infections; distributing oral and injectable contraceptives and condoms; promoting basic health messages on birth spacing and identification of pregnancy-related danger signs; and assisting with the referring of patients to health care centers. Second, Basic Health Center (BHC), which offers basic outpatient primary health care to between 15,000 and 30,000 Afghans. It is staffed by one nurse, a community midwife, and two vaccinators.

[3] The main international donors are United States Agency for International Development (USAID), World Bank (WB), European Commission (EC), and Asian Development Bank (ADB),), World Health Organization (WHO), United Nations International Children's Emergency (UNICEF), United Nations Population Fund (UNFPA), Japan International Cooperation Agency (JICA), and so on (MoPH, n.d.).

Third, a Comprehensive Health Center (CHC), which is responsible for delivering health care services for 30,000 to 60,000 inhabitants and is staffed by one pharmacist, one lab technician, and several male and female doctors, midwives, and nurses. Finally, District Hospitals (DH), which covers one to four districts and provides health care services for a population of between 100,000 to 300,000 people. The staff members of a DH include: a paediatrician, a surgeon, physicians, female obstetricians/gynaecologists, an anaesthetist, lab and x-ray technicians, a dentist, and a pharmacist.

In 2010, the MoPH considered adding two more stages to its new BPHS policy for Afghanistan. First, Health Sub-centers (HSCs), which were not included in the BPHS policy of 2005. Every HSC provides primary health care to between 3,000 and 7,000 people living in underserved and remote areas, and serves as an intermediate health care facility among HPs and other levels of BPHS. Each HSC is staffed by one community midwife, a male nurse, and a cleaner. Second, Mobile Health Teams (MHTs), which deliver health services to remote areas where the residents reside in small communities with no fixed health care centers. Each MHT has a male doctor/nurse, a female nurse/community midwife, a vaccinator, and a driver (MoPH, 2010).

The Essential Package of Hospital Services (EPHS) plays a significant role in the Afghan health care system by supporting primary health care facilities through a referral system. EPHS concentrates on the delivery of health care services at the following levels: (a) district level hospital (DH), which comes under the umbrella of BPHS and there are 49 district hospitals in Afghanistan. (b) Provincial hospital (PH), which has more specialized health services and staff compared to a district hospital. Each provincial hospital serves a referral point for patients from the district level, and there are 34 provincial hospitals. (c) Regional hospitals, which are usually equipped with diagnostic equipment and are staffed with more specialists. There are four regional hospitals in the country, and

all of them serve as referral hospitals for provincial hospitals. (d) National hospitals that provide only tertiary health care services and are mostly localized in Kabul, the capital of Afghanistan. These hospitals are the referral hospitals for provincial and regional hospitals; there are 20 national hospitals in the country that provide health care services and education and training to health care providers (MoPH, 2005; MoPH, 2012).[4]

Despite the significant role of the EPHS in the health sector of Afghanistan, the hospital system in Afghanistan still has numerous problems. Some of the main problems are: an inadequate number of hospitals to correspond to the demands of the population across the country, especially in the remote areas; lack of qualified and knowledgeable specialists in the rural areas; a shortage of skilled female medical staff in district hospitals; lack of adequate medical equipment; unequal distribution of hospitals per population size; and an uneven number of hospital beds. For instance, there are 1.28 beds per 1000 people in Kabul and 0.22 beds per 1000 people in provinces, which accounts for only 20% of the beds (MoPH, 2011; WHO, 2006).

Telecommunication Development in Afghanistan

Telecommunication services started from scratch in the post-Taliban Afghanistan. Eleven years ago, there were no telecommunication services in Afghanistan, the only available means of communication were the few thousands land lines. However, currently there are more than 17.41 million phone subscribers, which accounts for more than half of the population of Afghanistan. At present the population coverage by a mobile signal is 85% compared to 0.05% in 2002. In other

[4] There is a growing number of diagnostic and therapeutic private hospitals in Kabul and other major provinces of Afghanistan. However, there is no literature about their role within the health care system of Afghanistan.

words, telecommunication technology is rapidly developing in Afghanistan[5] and people's access to communication technology is gradually increasing (Anbarasan, 2012; Hamdard, 2012; PPIAF, 2010).

The number of Internet users in Afghanistan has also been on the rise because the Afghan government is prioritizing the facilitation of Internet access in some parts of the country. For example, in 2006, the Afghan Ministry of Communication and Information Technology (MCIT)[6] signed a "$64.5 million agreement with ZTE Corporation for the establishment of a countrywide fiber optic cable network. This will improve telephone, Internet, television and radio broadcast services throughout the country" ("E-commerce and Internet," 2009, para. 3). Currently, there are 42 companies that are licensed to provide Internet services in the country. The number of the Internet users is growing daily. For example, six years ago, there were nearly 200,000 Internet users, and this number has increased to approximately 1.8 million (Hamdard, 2012).

Statement of the Problem and Purpose of the Study

More than 75% of the population of Afghanistan resides in rural, remote, and mountainous areas (World Bank, 2012) and their access to health care is restricted to basic primary health care services with almost no access to specialized health care facilities and expertise. Thus, patients in rural areas have to spend a large amount of money and travel to big cities, mostly to Kabul, to obtain specialized health care services. However, from some areas, particularly the mountainous regions, this

[5] Rapid development and consistent growth of telecommunication services in Afghanistan have paved the way for private investment of 1.8 billion USD and has created more than 110,000 jobs in the country (USAID, 2012).
[6] The Ministry of Communication and Information Technology (MCIT) provides quality IT, communication, and mailing services at affordable prices throughout the country. MCIT envisions "to transforming Afghanistan into Information Society" (MCIT, 2012, para. 2).

long journey is not possible mainly due to the lack of a reliable and well-functioning transportation[7] infrastructure, which can impede timely referrals and evacuation of patients to speciality health facilities. Therefore, these problems seem to cause delays in the assessment, diagnosis and treatment of life-threatening and time-sensitive medical emergencies that require immediate medical interventions. One of the most life-threatening and serious medical emergencies, which requires timely medical assessment, diagnosis and treatment, is stroke.

There are no precise data and adequate studies on the morbidity and mortality of stroke victims in Afghanistan; however, there is an increase in the prevalence of stroke risk factors, such as diabetes and high blood pressure (hypertension) that can significantly contribute to the prevalence of stroke cases in Afghanistan. There are nearly one million diabetic patients in the country (MoPH, 2010), some of whom are not aware of their health problems due to low levels of literacy[8] and a lack of an adequate number of diabetes diagnostic and management centers (Davanzo, 2009). Lack of such awareness is one of the main reasons for patients' diabetes remaining uncontrolled and untreated, which can amplify the likelihood of stroke morbidity and mortality rates (Davanzo, 2009; MoPH, 2010). According to Davanzo (2009):

> Afghanistan is seriously affected by diabetes, however, despite various efforts and the acknowledgement by the authorities of the necessity to tackle this public health threat, the country still critically lacks sufficient knowledge on diabetes and its associated risks; adequate

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[7] According to the World Bank (2012) Afghanistan's transportation sector is one of the worst in the world. This weak transportation system has physically disconnected a large number of the residents in remote areas.

[8] According to the World Fact Book (2012) in Afghanistan 28.1% of the total population of age 15 and above can read and write. The male and female literacy rates are: 43.1% for men and 21.6% for women.

> diagnosis and treatment of the disease; and access to medical services. Additionally, awareness campaigns and targeted programmes are insufficient to fully inform the population about the dangers of diabetes. (p. 1)

Moreover, Brainin, Teuschi, and Kalra, (2007) argue that “developing countries have some of the highest stroke mortality rates in the world that account for over two-thirds of stroke deaths worldwide” (p.553). Although there is no literature to look into the case of Afghanistan, similar situations may also apply to Afghanistan.

According to the World Stroke Organization (2012), "1 in 6 people worldwide will have a stroke in their lifetime. 15 million people worldwide suffer a stroke each year and 5.8 million people die from it" (para. 2). Stroke is characterized by "sudden loss of blood circulation to an area of the brain, resulting in a corresponding loss of neurologic function" (Cruz-Flores, 2013, para. 1). There are two main types of stroke: ischemic and hemorrhagic. In ischemic strokes, which account for more than 80 percent of all cases of stroke, a blood clot blocks an artery in the brain. In hemorrhagic strokes, which account for less than 20 percent of stroke cases, a blood vessel in the brain ruptures and bleeds into the brain (American Stroke Association, 2011; Canadian Stroke Network, 2013; Cruz-Flores, 2013). The initiation of early treatment by blood thinners or thrombolytic agents is extremely important for optimal outcomes in the management of ischemic stroke patients (Cruz-Flores, 2013; Saver, 2012; Wechsler, 2011).

Blood thinners or thrombolytic agents are medications that dissolve blood clots. For example, tissue Plasminogen Activator (tPA)[9] is a blood thinner that, if administered within the first three to four and a half hours of a stroke's onset, results in better treatment outcomes and fewer complications. Hence, the early initiation of treatment with tPA is called "the golden three hour tPA window for stroke treatment" (Cruz-Flores, 2013; Saver, 2012; Vega, 2008, para. 1). Furthermore, according to the American Stroke Association (2011), "one minute of brain ischemia can kill 2 million nerve cells and 14 billion synapses" (para.1). Thus, time is a critical factor in the treatment of stroke patients. The sooner the treatment starts the better the result will be.

Furthermore, in the medical field knowledge sharing between and among various categories of health care practitioners is an indispensable, accepted, and common practice across the world. Professional knowledge sharing among health professionals is significant to enhancing the quality and efficiency of patient care in health care facilities (Dwivedi, Bali, & Naguib, 2007; Ryu, Ho, & Han, 2003). Additionally, it is essential that health care providers update their knowledge and expertise and keep abreast of medical advances and new medical information through reading medical books and journals, and attending morning rounds, medical lectures, conferences, and workshops (Curran, Murphy, Abidi, & McGrath, 2009)). However, it may not be possible for all health care providers in Afghanistan, especially those who live in rural and remote areas, to attend such medical workshops, conferences, lectures, and other educational events to stay up-to-date. As Waldman and Hanif (2002), claim that "after 20 years of conflict, Afghanistan has been left with an over-medicalised corps of health personnel that has not been able to stay abreast of recent advances in knowledge and medical

[9] In all the existing medical literature tissue Plasminogen Activator is abbreviated as tPA.

practice" (p.8). Against this backdrop, applications of telemedicine in Afghanistan may play an important role in knowledge sharing among health care providers. As Deng and Poole (2003) believe that telemedicine not only has the potential to improve accessibility to specialized health care services and reduce travel costs for patients and providers, but it also has the potential to facilitate knowledge sharing and transformation of medical practices among participants across distances.

Therefore, the main purpose of this study is to explore the potential role of telemedicine in the management of stroke patients and knowledge sharing among health care providers in Afghanistan. The study focuses on the use of telemedicine as a means among other efforts for better delivery of health care services to stroke patients, especially those living in the remote areas, where specialized health care services are limited.

Rationale for the Study

Applications of telemedicine have the potential to assist the delivery of specialized health care services to the inhabitants of rural and medically underserved urban areas, who encounter problems with shortages of specialized health care services (Craig & Patterson, 2006; Vo, Brooks, Farr, & Raimer, 2011). According to Smith et al. (2005), “telemedicine has the potential to help facilitate the delivery of health services to rural areas . . . telemedicine may also be useful for the delivery of education and teaching programmes and the facilitation of administrative meetings” (p.286). In addition, telemedicine connects specialists with primary health clinicians, increases provider-patient interactions, and enhances the quality of health care delivery (Field, 1996; Nouhi, Fayaz-Bakhsh, Mohamadi, & Shafii, 2012). Clinical telemedicine is used in different fields of medicine, such as cardiology, radiology, psychiatry, neurology, surgery, dermatology, oncology, and so on (Field, 1996;

Krupinski et al., 2002; Maheu, Whitten, & Allen, 2001). Some of the main reasons for telemedicine's wide-spread use are the recent developments in communication technology and the reduction in the cost of its implementation (Martinez & Gomez, 2008). For instance, "the cost of providing cancer care via telemedicine has decreased substantially since the practice began in 1950, and this cost reduction arises from decreasing costs of technology" (Doolittle, 2011, p. 4). In addition, after cost analysis of healthcare services that were provided via telemedicine consultation, as compared to face-to-face consultation, Barker, McNeill, Krupinski, and Weinstein (2004) ascertained that "the cost of providing services via telemedicine was found to be lower when a patient had to travel 127.5 miles or more to receive clinical services" (p. 381).

The ongoing growth and development in the telecommunication sector in Afghanistan will potentially help the Afghan health sector to extend the urban specialized health care expertise and services to rural and remote areas. Embracing telecommunication technology in the health care sector may facilitate and enhance rural communities' access to specialists and qualified health care providers, and they may no longer have to travel long distances in order to visit a specialist for medical consultation and health care services. According to Chandrasekhar and Ghosh (2001):

> The development of ICTs can bring about improvements in health in developing countries in at least three ways: as an instrument for continuing education they enable health workers to be informed of and trained in advances in knowledge; they can improve the delivery of health and disaster management services to poor and remote locations; and they can increase the transparency and efficiency of governance, which should, in turn, improve the availability and delivery of publicly provided health services. (p.850)

Overview of the Thesis

This study is divided into six main chapters. The introductory chapter provides a brief overview of the role of ICT in the health sector and elaborates on the development of telecommunication in Afghanistan. In addition, this chapter talks about the health context of Afghanistan and discusses the purpose and rationale for this study. Chapter two provides a review of the existing literature on telemedicine and presents a discussion on the theoretical framework for this study. Chapter three delineates the methodological approach used in this study. It also elaborates on the research design and reasons for applying it to execute this research study. Moreover, this chapter explains sampling and data collection methods as well as the data analysis techniques employed in the study. Chapter four reports the results of the study and analyzes the findings. Chapter five discusses the findings of the study in relation to the main research questions, which are guided by the theoretical framework of this study. In addition, this chapter compares and analyzes the findings from the respondents' interviews with the literature review of this investigation. Finally, chapter six presents the main conclusions, provides recommendations, and elaborates on the limitations and opportunities for future research.

Chapter Two: Literature Review

This literature review focuses on the importance of communication technology in the medical field, specifically the use of technology that facilitates communication and interaction among health care providers and patients. In addition, the literature review seeks to review the role of telemedicine in the better management of stroke patients as well as the promotion of knowledge sharing among health care providers across distances. It also presents a discussion on the theoretical framework used

for this study. Accordingly, this chapter is divided into the following sections: history and evolution of telemedicine; definition of telemedicine and other relevant terms; applications of telemedicine; potential advantages of telemedicine; cost-effectiveness of telemedicine; patient satisfaction with telemedicine; perceived barriers to telemedicine; telemedicine and knowledge sharing; telemedicine and health communication; telemedicine in the developed countries; telemedicine in the developing countries; theoretical framework; and research questions.

History and Evolution of Telemedicine

The purpose of this section of the literature review is to shed some light on the history and evolution of telemedicine. Apparently, telemedicine was developed along with the other advances in ICT over the last two to three decades, but if telemedicine is considered as medicine across distances, regardless of the way of communication and transmission of information is carried out, then the history of early practices of telemedicine is much older and goes back over 30 years (Adewale, 2004; Wootton, Craig, & Patterson, 2006). In ancient times telemedicine was practiced by using very primitive communication tools such as flags and bells to transmit health-related messages to others at a distance. For example, "ships carrying the plague flew yellow flags to indicate their ship was in quarantine and to keep other ships away" (Ganesh & Roa, 2002, para. 10). Wootton, Craig, and Patterson (2006) mention that an early practice of telemedicine, “perhaps one of the first public health surveillance networks, was in the Middle Ages, when information about bubonic plague was transmitted across Europe by such means as bonfires” (p. 6).

Behind the growth and development of telemedicine lies the development and advances in telecommunication technology. Development of telecommunication technology, such as the invention

of the telegraph in 1844 and the invention of the telephone in 1876, increased medical communication by reducing the barriers to distance among patients and health care providers, and facilitated interactions among physicians, which resulted in better knowledge sharing and improved health care services (Cipolat & Geiges, 2003; Sosa-Iudicissa, Wootton, & Ferrer-Roca, 1998). In addition, radio communication was considered as a means of medical communication in World War I (Cipolat & Geiges, 2003). Radio was widely used for medical communication at the end of the 19th century. It was utilized as an effective communication tool by providing medical consultation to seafarers and to help stabilize patients during medical emergencies on board airplanes (Sosa-Iudicissa, Wootton, & Ferrer-Roca, 1998). In addition, in late 1950s video communication was used for the first time in health care practices. For example, in late 1950s "the Nabraska Psychiatric Institute used a two-way interactive television system for telepsychiatry consultations with Norfolk State Hospital, 112 miles away" (Maheu, Whitten, & Allen, 2001, p.5).

Furthermore, since the 1960's, the National Aeronautics and Space Administration (NASA) has also significantly contributed to the development and evolution of telemedicine. NASA sent its first American astronauts into the space in the early 1960s and "in order to better understand the impact of space flight on the human system, biomedical instrumentation was connected to these astronauts so that physiological data could be telemetered to ground controllers" (Doran, Nicogossian, & Merrell, 2009, p. 19). Medical consultation through telemedicine with NASA's ground health care providers has positively impacted the safety and well-being of astronauts during space flights; thus, telemedicine has been considered an integral part in the success and achievement of "human space flight programs" (Doran et al., 2003, p. 104; Nicogossian, Pober, & Roy, 2004). Notwithstanding, NASA's telemedicine projects have not only focused on astronaut safety and health-related issues, but

they have also concentrated on the terrestrial application of telemedicine in remote areas during natural and man-made disasters since the 1970s. For example, NASA provided emergency health care services through telemedicine to the victims of earthquakes in Mexico City in 1985 and in Armenia in 1988 (Garshnek & Burkle, 1999; Nicogossian, Pober, & Roy, 2004).

The history and evolution of telemedicine is divided, in relation to the development of technology, into pre-electronic and electronic phases. The pre-electronic telemedicine dates back to the Middle Ages. For example, during the Middle Ages rich patients sent their urine samples to their health care providers for urine tests and diagnoses. This example could be considered as an early practice of telepathology.[10] In addition, teleprescribing was another form of telemedicine, which was practiced before and after the development of postal services in mid-19th century. For instance, patients were writing and sending their medical history to their health care providers through postal services for diagnosis of their diseases and getting necessary prescriptions from their providers (Sosa-Iudicissa, Wootton, & Ferrer-Roca, 1998).

Electronic telemedicine's history and evolution has developed concurrently with the development and advances in information and communication technology. At the early stages, the development of the analogue telecommunication technology such as the telegraph, telephone, radio, and later on developments in digital telecommunication technology have facilitated the application of telemedicine in various medical fields (Field, 1996; Sosa-Iudicissa, Wootton, & Ferrer-Roca, 1998). For example, the invention of telegraphy in mid-19th century enabled health care providers to help

[10] "Telepathology is the transmission of microscopic images over telecommunications lines. The pathologist sees images on a monitor instead of under a microscope" (Burke & Weill, 2005, p. 62).

their patients in remote areas; the innovation of telephony[11] in the late 19th century had assisted in the utilization of telemedicine since its initiation; developments in wireless communications have facilitated the advancements of mobile phones and mobile telemedicine; and the advent of inexpensive digital communication has led to the growth of videoconferencing which has been largely used in telemedicine programs (Adewale, 2004; Sosa-Iudicissa, Wootton, & Ferrer-Roca, 1998).

Definition of Telemedicine and other Relevant Terms

The availability and accessibility of quality health care services are major problems humankind is facing in the 21st century (Craig & Patterson, 2006). In a traditional medical practice health care providers and patients are present in the same location, at the same time. However, it is not possible for everyone to have equal access to health care services, especially the specialized health care services. Fortunately, recent developments and advances in ICT have provided great opportunities for assisting and facilitating access to good health care services, especially for those who live in geographically remote areas or in medically underserved urban and rural areas (Craig & Patterson, 2006). There are various terms describing the delivery of curative, preventive, and administrative health care services through the application of ICT across distances. Below are definitions of some of the most common terms:

[11] In 1910 a telestethoscope was used for remote auscultation by physicians. Tele-stethoscope transmitted amplified patients' sounds through the telephone (Sosa-Iudicissa, Wootton, & Ferrer-Roca, 1998). Telestethoscope, which is low cost medical equipment, is still used for remote auscultation by physicians and specialists (Adewale, 2004).

Telemedicine. The term telemedicine, which literary means "distance healing" (Biswas, 2002, para. 2) is derived from two words, "'Tele' is a Greek word meaning 'distance' and 'mederi' is a Latin word meaning 'to heal'" (Dasgupta & Deb, 2008, para. 2). In other words, the "prefix 'tele' is derived from the Greek for 'at a distance'; hence, more simply, telemedicine is medicine at a distance" (Craig & Patterson, 2006, p. 4). Coiera (1995) states that "definitions of telemedicine abound" (p. 1381); therefore, this study mentions the broad and most comprehensive definitions of telemedicine. Sood et al. (2007) collected 104 peer-reviewed definitions of telemedicine during their six-month literature review and found a comprehensive definition for telemedicine that encompasses medical, technological, and spatial features of telemedicine. They define telemedicine as "being a subset of telehealth, [and the one that] uses communications networks for delivery of health care services and medical education from one geographical location to another, primarily to address challenges like uneven distribution and shortage of infrastructural and human resources" (p. 576). Additionally, the World Health Organization (1997) provides the following comprehensive definition for telemedicine:

> Telemedicine is the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communications 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 health care providers, all in the interests of advancing the health of individuals and their communities. (p.10)

The essence of telemedicine is to transfer medical expertise and knowledge across distance, and facilitate clinical care and information exchange, "whether that information is voice, an image,

elements of a medical record, or commands to a surgical robot" (Coiera, 1995, p. 1381; Medina-Garrido, & Crisóstomo-Acevedo, 2009; Stanberry, 2001).

Telehealth. Cradduck (2010) defines telehealth as "the provision of health information and services over distance mediated by information and communications technologies" (p. 4). The literature distinguishes between telemedicine, which mainly focuses on therapeutic medicine, and telehealth, which encompasses a broader scope than telemedicine and centers on the delivery of public health services at a distance to people who are not necessarily ill, but may wish to stay healthy (Maheu, Whitten, & Allen, 2001). According to the Health Resources and Services Administration (H R S A) (2004), telehealth is the use of ICT in a health care system to "provide health care services at a distance, to include diagnosis, treatment, public health, consumer health information, and health professions education" (p. 9). Application of telehealth extends beyond just curative medicine; telehealth is also applied in public health and health administration. For instance, it is used for health education, health promotion, and diseases prevention across distance (Craig & Patterson, 2006; Maheu, Whitten, & Allen, 2001).

According to the Canadian Telehealth Forum (CTF) (2011), by eliminating distance barriers in remote areas, telehealth assists in reducing disparities in the access to clinical health care services; provides continuing medical education (CME) for medical staff; supports health education programs for patients and their family members or their care givers; and facilitates administrative meetings within health facilities. A good example of telehealth is home telehealth, which delivers health care services to the homes of patients with chronic diseases, such as diabetes, heart failure, and chronic pulmonary diseases (Britton & Chetney, 2004). Telehealth connects patients with chronic diseases to health care providers through synchronous and asynchronous ICT in order to provide information,

education, and monitoring of their vital signs, basic laboratory tests such as blood glucose, and auscultation of heart and lungs sounds. Telehealth actively engages patients in the management of their health care and facilitates monitoring of their vital signs while they are at home, and in case of any exacerbations in their vital signs and worsening of their health conditions they can receive immediate medical assistance (Britton & Chetney, 2004; Cradduck, 2011; Koch, 2006; Stamm, 2001; Stowe & Harding, 2010).

E-health. E-health is the "integration of telehealth technologies with the Internet" (Riva, 2000, p. 989). The evolution of e-health is a clear example of the significance of ICT and its positive contributions to improve the delivery of health care services across distances (Oh, Rizo, Enkin, & Jadad, 2005). Maheu, Whitten, and Allen (2001) state that "e-health refers to all forms of electronic health care delivered over the Internet, ranging from informational, educational, and commercial 'products' to direct services offered by professionals, non-professionals, businesses, or consumer themselves" (p. 3). Moreover, e-health differs from telemedicine because telemedicine is driven only by health care professionals; whereas, e-health is linked to and driven by non-professionals, consumers, professionals, and industries (Mea, 2001).

Telecare. Telecare is defined as the remote delivery of health care services to users in their homes via the application of ICT (Tang, Gann, & Curry, 2000). Through the use of telecare patients with chronic heart disease, diabetes, and respiratory insufficiencies do not have to visit health care providers for measuring their blood pressure, pulse rate, and body temperature, testing their blood glucose; and performing their ECGs; instead patients perform these measurements and tests at their

homes and the measurements are transferred to their telecare centers, where telenurses[12] evaluate them (Oudshoorn, 2011). According to Botsis and Hartvigsen (2008), the application of home telecare is quite new and was first discussed in 1997 in a published paper. Nevertheless, home telecare has developed rapidly since 2001 and has benefited elderly patients with chronic disease by monitoring their vital signs across distance, decreasing the number of clinic and hospital visits, and improving their quality of life (Botsis & Hartvigsen, 2008).

M-health. Developments and advances in ICT, more specifically development in networking and wireless communication technologies, have facilitated the emergence of mobile services in health care systems (Kyriacou, Pattichis, M., Pattichis, Panayides, & Pitsillides, 2007). Istepanian, Pattichis, and Laxminarayan (2006) define m-health as "emerging mobile communications and network technologies for health care" (p. 3). M-health is an evolving field of e-health that supports therapeutic and public health services by integrating wireless communication technology, such as mobile devices, into the health care system. It has the potential to facilitate the delivery of health care services across the world (WHO, 2011). M-health is practiced in both developed and developing countries; however, it is widely used in the developed countries compared to developing countries (WHO, 2011). An example of an m-health application in the developing countries is the use of mobile text messages for raising public awareness regarding maternal and child health, HIV, malaria, and other communicable diseases (WHO, 2013).

[12] Telenurses are a new group of health care experts who act as mediators among patients, telecare tools, and other health care providers (Oudshoorn, 2011).

Applications of Telemedicine

Filed (1996) states that there are clinical and non-clinical applications of telemedicine. Clinical applications of telemedicine focus on the assessment, diagnosis, and treatment of specific patients, and non-clinical telemedicine applications concentrate on continuing medical education (CME) as well as managerial and administrative meetings among health care providers. Clinical telemedicine is utilized in almost all areas of medicine, such as radiology, psychiatry, pathology, dermatology, primary care, infectious diseases, cardiology, endocrinology, ophthalmology, ear, nose and throat (ENT), surgery, oncology, rheumatology, emergency medicine, neurology, and pediatrics (Field, 2001; Krupinski, Nypaver, Poropatich, Ellis, Safwat, & Sapci, 2002; Maheu, Whitten, & Allen, 2001). An application of telemedicine is classified according to: (1) specificity of diseases; (2) medical speciality; (3) site of care and specific treatment modalities; (4) and technology and timing (Bashushur, Krupinski, & Grigsby, 2011; Mutausitz & Breen, 2007; WHO, 2010).

Applying telemedicine according to specificity of diseases includes the management of specific diseases such as diabetes, stroke, and chronic heart and respiratory diseases. In this type of telemedicine application “a specific diagnosis is made, and then the disease is treated using the most appropriate form of telemedicine services available” (Bashushur, Krupinski, & Grigsby, 2011; Mutausitz & Breen, 2007, p. 74). For example, the use of telemedicine for evaluation, diagnosis, and treatment of stroke patients is called telestroke. This term was first used by Levine and Gorman in 1999 (Wechsler, 2008). Telestroke is defined as "the use of audio, video, or other telecommunications and electronic information processing to transmit data that are relevant to the diagnosis and treatment of acute stroke” (Dashpande, Khoja, McKibbon, Rizo, & Jadad, 2008, pp. 14-15). According to the

Canadian Stroke Network (2011), telestroke provides a great opportunity for the timely treatment of stroke patients in rural and remote areas, and can be utilized for acute treatment, follow-up, and rehabilitation of stroke patients.

Furthermore, telemedicine is applied according to the medical specialities, such as teleradiology, telepathology, telederamtatology, telepsychiatry, telecardiology, telesurgery, and so forth (Bashushur, Krupinski, & Grigsby, 2011; Mutausitz & Breen, 2007). For instance, teleradiology, which commonly uses asynchronous technology to transmit radiologic images, is the oldest, well-established, well-accepted, and prevalent form of telemedicine; whereas, applications of telemedicine in pediatrics and emergency medicine have been evolving recently (Bruke & Weill, 2005; Field, 1996; Krupinski et al., 2002). In addition, the application of telemedicine differs according to the site of care, such as an emergency department (ED), intensive care unit (ICU), or outpatient department (OPD). Similarly, some telemedicine "programs have been organized around specific treatment modalities such as rehabilitation (e.g., speech/language pathology, physical therapy) and pharmacy" (Bashushur, Krupinski, & Grigsby, 2011, p. 491).

Furthermore, the application of telemedicine varies based on the technology, timing, and how the information is transmitted (Bashushur, Krupinski, & Grigsby, 2011; WHO, 2010). There are two modalities for the transmission of information in telemedicine. (1) Asynchronous or "store-and-forward" telemedicine, such as email, in which pre-recorded information among health care providers is exchanged and they do not necessarily interact simultaneously. This is widely used in non-emergency medical conditions such as dermatology and pathology. (2) Synchronous or "real time" applications of telemedicine, such as videoconferencing in which the exchange of information

happens simultaneously and both sides need to be present to interact and communicate with one another. Synchronous applications of telemedicine are crucial in life-threatening and time-sensitive medical emergencies. In both synchronous and asynchronous modalities of telemedicine, various forms of technologies such as "videoconferencing, telemetry and remote sensing, and other modes of interactive health communication" (Bashushur, Krupinski, & Grigsby, 2011, p. 491) are used to transmit and exchange “variety of media, such as text, audio, video, or still images" (Craig & Patterson, 2006; Mea, 2006; Mutausitz, & Breen, 2007; WHO, 2010, p. 10; Wootton, 2006). Additionally, successful implementation of a telemedicine program not only requires the necessary ICT equipment, but it also requires committed, trained, and skillful personal (Harnett, 2006).

Moreover, in the medical field it is essential that health care providers update their knowledge and expertise and stay abreast of medical advances and new medical information through reading medical books and journals, and attending morning rounds, medical lectures, conferences, and workshops (Curran, Murphy, Abidi, & McGrath, 2009). However, it may not be possible for all health care providers, especially those who live in rural and remote areas, to attend such medical workshops, conferences, lectures, and other educational events to stay up-to-date. Therefore, they may feel professionally isolated and unable to remain updated on new advances and information in the medical field (Callas, Ricci, & Caputo, 2000; Curran, Murphy, Abidi, & McGrath, 2009). Fortunately, telemedicine facilitates the delivery of CME programs to rural health care providers, and reduces the need for travel, decreases feelings of professional isolation, and increases the ability of health professionals to remain current with new medical information and advances (Callas, Ricci, & Caputo, 2000; Curran, Murphy, Abidi, & McGrath, 2009).

Potential Advantages of Telemedicine

The use of ICT in the delivery of health care services across distance "has the potential to be one of the defining medical revolutions of the 21st century" (Vo, Brooks, Farr, & Raimer, 2011, p. 7). There is a lot of momentum to improve access to quality health care services, and telemedicine has proven that it overcomes geographical and socio-economic obstacles and improves access to health care services, particularly for medically underserved communities in rural and remote areas who encounter problems with shortages of specialized health care services. Thus, improving access to quality health care services is one of the greatest advantages of telemedicine, as it is "enabling the provision of access to care where it is otherwise not likely to be available" (Vo, Brooks, Farr, & Raimer, 2011; Whitten, Cook, & Cornacchione, 2011, p. 87).

Ashley (2002) ascertains that there are several key advantages of telemedicine applications in health care services, including the elimination of physical distances among providers and patients; improvement in the quality of health care services by facilitating medical training and education; and improving skills and expertise of health practitioners across distance. Similarly, Mutusitz and Breen (2007) categorize advantages of telemedicine "according to five main abilities: the ability of telemedicine to (a) transcend geographical boundaries; (b) transcend temporal boundaries; (c) reduce costs; (d) increase patient comfort, security, and satisfaction; and (e) digitize health communication via Web-based services" (p. 76). In addition, Hjelm (2006) mentions that some of the potential advantages of telemedicine are "improved access to information; provision of care not previously deliverable; improved access to services and increasing care delivery; improved professional education; quality control of screening programmes; and reduced health-care costs" (p. 135).

According to Nesbitt (2007), applications of telemedicine have some additional advantages, such as “reduced patient costs for travel, reduced absences from school and work to go to medical appointments, health system efficiencies…, and local economic gains as residents remain in the community for care” (p. 1). Below, this literature review elaborates on the cost-effectiveness of telemedicine and patient satisfaction with telemedicine.

Cost-effectiveness of Telemedicine

One of the main reasons for the wide-spread use of telemedicine is the recent development and reduction in the cost of communication technology (Martinez & Gomez, 2008). For instance, "the cost of providing cancer care via telemedicine has decreased substantially since the practice began in 1955. This cost reduction arises from decreasing costs of technology and the increasing number of patients visits for which this technology is used" (Doolittle, Spaulding, & William, 2011, p. 673). Analysis of telemedicine cost-effectiveness[13] is an important component of a telemedicine program, which needs to be performed in the planning and execution phases of a telemedicine program (Whited, 2010). However, the analysis of the cost-effectiveness of telemedicine utilization is a challenging task (Taylor, 2006), and it seems unlikely to simplify the cost-effectiveness of telemedicine and state whether or not it is cost-effective compared to conventional health care practices (Mistry, 2012).

Cost-effectiveness of telemedicine largely depends on different factors, including the need for health care services in remote and medically underserved rural and urban areas; availability of

[13] Whited (2010) states that “cost-effectiveness is a specific term implying that both relative costs and relative effectiveness of two or more competing strategies have been assessed” (p. 224).

physicians in these areas; and utilization of telemedicine facilities and equipment in various medical subspecialties and specialities (Agha, Schapira, & Maker, 2002). For example, it is crucial to conduct an onsite needs assessment for the delivery of specialized health care services and determine whether or not the number of those patients who require such services is adequate to initiate and sustain a telemedicine program. If the number of people who need specialized health care services is low or too high, then telemedicine will not be a cost-effective option, because if the number of the beneficiaries is too low then the cost of the telemedicine program will be too high in comparison with the services it provides as well as if the number of the beneficiary is too high, then bringing specialists to these areas will be more cost-effective than the application of telemedicine (Agha, Schapira, & Maker, 2002).

In addition, Taylor (2006) claims that telemedicine is cost-effective because all communication and contacts between providers and patients do not require face-to-face interactions; therefore, it seems "unlikely that all such transactions require high-resolution, high-bandwidth and high-fidelity interactive television" (p. 114). Moreover, telemedicine can be considered a cost-effective solution for improving access to quality health care services in remote and underserved areas, especially in areas where patients' travel costs, to see specialists, are higher than the costs of telemedicine consultations (Agha, Schapira, & Maker, 2002; Hjelm, 2006; Nessa, Ameen, Ullah, & Kwak, 2010). Telemedicine reduces travel costs and saves patients time; therefore, the cost-effectiveness of telemedicine should be calculated based on patients travel expenses, lodging costs, and "lost productivity" (Agha, Schapira, & Maker, 2002. p. 290).

Barker, McNeill, Krupinski, and Weinstein (2004), after cost analysis of health care services that were provided via telemedicine consultation, as compared to fact-to-face consultation,

ascertained that "the cost of providing services via telemedicine was found to be lower when a patient had to travel 127.5 miles or more to receive clinical services" (p. 381). Furthermore, cost-effectiveness of telemedicine varies according to the medical speciality and technology modality. For instance, teleradiology is more cost-effective than telecardiology, since teleradiology is mostly asynchronous or store-and-forward Internet based technology is used (Maheu, Whitten, & Allen, 2001; Mistry, 2012; Whitten, Cook, & Cornachione, 2011).

Patient Satisfaction with Telemedicine

Patient satisfaction[14] is a significant aspect of telemedicine applications. Existing literature suggests that the majority of patients are satisfied with telemedicine consultations, because such consultations assist them with seeking medical advice, assistance, and information from health care providers, and facilitate their communication with specialities across distances (Ferguson, 2006; Wright, Sparks, & O'Hair, 2008). For instance, Gustke, Balch, West, and Rogers (2000) evaluated patient satisfaction rates of telemedicine consultations by collecting and reviewing data from 495 synchronous telemedicine consultations at the "Telemedicine Center at East Carolina University School of Medicine in Greenville, NC" (p. 5), and concluded that the overall patient satisfaction rate with telemedicine consultations was 98.3%. The reasons for this higher satisfaction rate with telemedicine consultations include: "ease in arranging appointments, waiting time, how time with the physician is spent, and travel time" (Gustke, Balch, West, & Rogers, 2000, p. 10).

In addition, Krousel-Wood et al. (2001) studied providers and patients' levels of satisfaction with the application of telemedicine for the treatment of patients with high blood pressure

[14] Patient satisfaction is defined as "the fulfilment of the expectations or perceived needs of the patients" (MethoTelemed, 2010, p. 29).

(hypertension). They ascertained that "physicians reported significant increases in overall work, mental effort, technical skill, risk/psychological stress and visit duration for the telemedicine visit in comparison with the in-person visit" (pp. 208-209). According to Whitten and Mair (2000), usually patients and providers prefer face-to-face consultations; nevertheless, "if the choice is between a timely interactive video consultation, and a face-to-face consultation following a wait of several days or weeks, then there are indications that patients may opt for the telemedical consultation" (p.419).

Furthermore, Callahan, Hilty, and Nesbitt (1998) assessed the feasibility of using telemedicine as a means for providing psychiatric consultations to patients in a rural primary care setting and concluded that "ratings from patients receiving mental health consultation using telemedicine yielded levels of satisfaction similar to those found in telemedicine consultations in non-mental health medical areas" (p. 363). Therefore, they support that telemedicine can be used as a means of providing mental health consultations for patients in rural primary health care settings, and suggest that some mental health patients may prefer telemedicine consultations over face-to-face consultations, because telemedicine consultations assist them in receiving psychiatric consultations in primary health care facilities and "perhaps minimizing stigma as well as travel" (p. 368). Notwithstanding, it is difficult to focus on a particular telemedicine project and conclude whether or not patients are satisfied with the applications of telemedicine across various medical specialities and subspecialties (Whitten & Mair, 2000).

Perceived Barriers to Telemedicine

Despite all the advantages and promises of telemedicine, it is not a solution for all the health care problems (Matusitz & Breen, 2007; Sarin, 2006). Craig and Patterson (2005) contend that

telemedicine is "not the panacea that will cure all of the world's health-related problems or a means by which health care workers can be replaced" (p. 4). There is a long journey before telemedicine reaches its full potential. Still telemedicine is underutilized and populations in rural and underserved areas, who could have potentially benefited from the application of telemedicine, do not have access to telemedicine services (Miller, 2010). Hjelm (2006) claims that "the fact that telemedicine might have great potential for improving health-care delivery does not necessarily mean that it will be implemented" (p. 148). There are numerous barriers that contribute to the underutilization of telemedicine. Some of these barriers include, but are not limited to, technological, financial, ethical and legal barriers (Hjelm, 2006; Paul, Pearlson, & McDaniel, 1999; Rogove, Demaerschalk, & Vespa, 2012). Furthermore, Rogove, Demaerschalk, and Vespa (2012) categorize the barriers to the acceptance and utilization of telemedicine as being both human and technological.

Human barriers involve administrative, professional, cultural, legal and regulatory issues. Technological barriers are often considered as important reasons for the underutilization of telemedicine. Insufficiency of technology to perform the required tasks and objectives properly causes uncertainty and unreliability in the telemedicine system, and contributes to diminished adoption and application of telemedicine in the medical field (Paul, Pearlson, & McDaniel, 1999). Furthermore, difficulties in adequately funding the initial investment, operational and maintenance costs of telemedicine projects will also impede the initiation and long-term sustainability of telemedicine programs (Broens et al., 2007; Paul, Pearlson, & McDaniel, 1999). Financial barriers, such as "inability to bill for services while needing to pay for additional technology" (Rogove, Demaerschalk, & Vespa, 2012, p. 50), and reimbursement of telemedicine services also hamper the successful implementation of telemedicine (Rogove, Demaerschalk, & Vespa, 2012; Whitten, Cook, &

Cornacchione, 2011). Reimbursement of telemedicine services has been a major barrier to the embracement and utilization of telemedicine (Whitten & Buis, 2007; Whitten, Cook, & Cornacchione, 2011). However, successful measures have been taken to address this issue and private insurance companies have also been urged to reimburse telemedicine consultations (Whitten & Buis, 2007). For example in the United States, California, which has been one of the pioneering states in the utilization of telemedicine since the 1990s, enacted a law in 1996, that mandates for telemedicine reimbursement. The main objective of "the Telemedicine Development Act of 1996 was to reach underserved populations who, due to geographic and/or economic barriers, could not access health care" (Atkins, 2011). The passage of this law has obliged insurers to reimburse telemedicine consultations and has forbidden them from requiring direct face-to-face medical consultations between providers and patients (AMD Global Telemedicine, 2012).

In addition, there are many legal and ethical concerns that have negative impacts on the implementation of telemedicine. These legal and ethical concerns include, but are not limited to, privacy, confidentiality, and security of patients' information and medical records; inter-state or cross-border telemedicine consultations; and professional liabilities (Whitten, Cook, & Cornacchione, 2011; Stanberry, 2006; Maheu, Whitten, & Allen, 2001). Toader, Damir, and Toader (2011) state that in health care practices, apart from the medical knowledge, expertise, and communication skills, treatment of patients require some level of trust, confidence, and intimacy between health care providers and patients. On the one hand, telemedicine is a good solution for providing health care services to medically underserved inhabitants in rural areas, but on the other hand, it may "encourage depersonalization and diminish the trust that defines the relationship between patients and health care providers" (p. 3).

Additionally, the ethical aspects of telemedicine require medical doctors to pay the same level of attention and care during the telemedicine consultations as they do in face-to-face doctor-patient consultations. Moreover, they should implement strict measures to protect patients' data from damage, theft, and access by unauthorized individuals (Toader, E. Damir, & Todar, 2011).

Licensure is another crucial legal barrier to the adoption and application of telemedicine (Whitten, Cook, & Cornachione, 2011), because "medical personnel are required to be licensed by the state in which they practice" (Burke & Weill, 2005, p. 69). Therefore, physicians or other health practitioners who engage in inter-state telemedicine consultations must be licensed to practice medicine in each state where their patients are located (Glenn, 2012). The state licencing requirement hinders the acceptance and use of telemedicine across states, because "state licensure restrictions run counter to telehealth's ability to transcend geographical boundaries" (Maheu, Whitten, & Allen, 2001, p. 175). However, Filed (1996) contends that the state licensure laws do not negatively affect many telemedicine programs, which operate in a specific single state. According to the Federation of State Medical Boards (FSMB) (2012), some states issue a telemedicine licence or certificate, which enables health practitioners to practice telemedicine consultations across state boundaries. Notwithstanding, obtaining a license to practice telemedicine across state lines is a costly and lengthy process, because some states require a face-to-face interview with health practitioner before issuing a license, which adds to the travel costs and paperwork (Burke & Weill, 2005; Filed, 1996).

Moreover, the issue of telemedicine malpractice liability is another legal issue that hinders telemedicine development. There is a major concern regarding the legal accountability of patients who are diagnosed and treated via telemedicine (Maheu, Whitten, & Allen, 2001). For instance, in

cases of a malpractice, the issue of medical liability insurers becomes problematic, because “in the case of injury or malpractice, jurisdiction is questionable” (Maheu, Whitten, & Allen, 2001, p. 175). In addition, “when there is no signed agreement between the patient and the practitioner that delineates jurisdiction, determining which state has authority is potentially problematic in the case of a lawsuit” (Maheu, Whitten, & Allen, 2001, p. 175). Therefore, during a telemedicine consultation it should be determined that in case of a malpractice the law of which state should be enforced. Will it be the state where the tele-practitioner lives and provides telemedicine consultation, or will it be the state where the patient who receives medical consultation resides (Ashley, 2002; Bruke & Weill, 2005; Matusitz & Breen, 2010; Stanberry, 2001)? More notably the issue of medical liability turns into a major legal problem when it becomes difficult to ascertain whether the malpractice is due to the technology failure or practitioner negligence (Ashley, 2002; Field, 1996; Stanberry, 2001).

Although, there are some common barriers to the adoption and implementation of telemedicine in both developed and developing countries, there are also some additional barriers and obstacles that hamper the execution of telemedicine in developing countries. Doarn (2004) identifies certain reasons as barriers and challenges in the implementation of telemedicine in developing countries which include:

> No immediate access to definitive care, distance and geography, limited communications, limited diagnostic, treatment, and pharmaceuticals, language, cultural diversity, autonomy, extreme conditions, financial, legislative policy, socioeconomic and political, access, technology availability and capability, and arrogance. (p. 43)

Telemedicine and Knowledge Sharing

Prior to discussing the role of telemedicine in knowledge sharing among physicians, specialists, and other health care providers across distance, this study elaborates on some of the basic concepts and definitions related to knowledge, knowledge sharing, knowledge transfer, and knowledge exchange. There are various definitions for the term knowledge. Nonaka and Nishighuchi (2001) define knowledge as "a dynamic human process of justifying personal belief toward the 'truth'" (p. 14). Similarly, Young (2008) defines knowledge as "a combination of experience, theory and heuristics, developed by an individual or a community of practice, which allows decisions to be made and correct actions to be taken"[15] (p. 5). Likewise, Styhre (2011) delineates that "knowledge is what a certain group of individuals believe corresponds to how the world works or constituted" (p. 51).

There are two types of knowledge: (1) Explicit knowledge that encompasses codified or recorded knowledge and means knowledge that expresses ideas in words or numbers or both. It can be easily communicated and shared among individuals or organizations verbally or in writing. (2) Implicit or tacit knowledge is a kind of knowledge that is very personal and is based on skills. It is comprised of non-codified or head knowledge and it is challenging to express, verbalize, and write down implicit knowledge; therefore, it is difficult to communicate and share implicit knowledge with other individuals or organizations (Lafemina, 2002; Wenneker, Selm, & Nelissen, 2002; Young, 2008). In addition, sharing and exchange of tacit knowledge requires close interaction and long term cooperation among individuals and organizations (Man, Berends, Lammers, Raaij, & Weele, 2008).

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[15] "Communities of practice are social structures that focus on knowledge and explicitly enable the management of knowledge to be placed in the hands of practitioners" (Wenger, 2004, p. 2).

Lee (2001) describes knowledge sharing as "activities of transferring or disseminating knowledge from one person, group or organization to another" (p. 324). Knowledge sharing is a key component of knowledge management,[16] which enables individuals and staff of an organization to exchange their knowledge and experience with each other (Nemani, 2011). The main objective of knowledge sharing is "the systematic distribution and effective diffusion of knowledge throughout the organization" (Wallance, 2007, p. 110). Knowledge sharing and transfer are vital for sustainable organisational development because they provide competitive advantages to organizations by increasing their organizational learning improving staff skills and promoting their involvement within organizations, and enhancing efficacy and transparency in organizations. Therefore, it is important that organizations find effective ways to share and transfer knowledge from their expert and veteran staff to novices and less experienced staff who need to obtain more knowledge and expertise (Hinds, Patterson, & Pfeffer, 2001; Lee, 2001; Staiger, 2008; Wang & Noe, 2010).

Furthermore, knowledge sharing requires an optimal environment where people can feel comfortable sharing their knowledge with each other. According to E. F. Cabrera and Cabrera (2007), knowledge sharing can be influenced "by creating an environment in which there are strong social norms regarding the importance of sharing one's knowledge with others… [and by providing] an environment of caring and trust that is so important for encouraging individuals to share with others" (p. 728). Moreover, an environment that is conducive to transformation of knowledge from one

[16] Knowledge management is "getting the right knowledge to the right people at the right time so they can make the best decision" (Petresh, 1996, as cited in Beckman, 1999, p. 6). Moreover, knowledge management is "an umbrella term encompassing the many unique but related facets of knowledge-exchange, transfer and uptake among them" (Dubois & Wilkerson, 2008, p. 5). Knowledge management is a process that "involves the acquisition, storage, retrieval, application, generation, and review of the knowledge assets of an organization in a controlled way" (Watson, 2003, p. 5).

individual to another is called "Ba" (Levy, 2010). “Ba” is a Japanese word that “refers to a physical, virtual, and/or mental space shared by two or more individuals or organizations” (Nonaka & Nishighuchi, 2001, p. 4). Through this shared space social relationships emerge that can be conducive and beneficial for knowledge creation (Nonaka & Nishighuchi, 2001).

In addition, there are several enablers to knowledge sharing, which can facilitate knowledge sharing within an organization. Creating a culture of knowledge sharing and appreciating those who are willing to share their knowledge are some of the key enablers of knowledge sharing within an organization. For example rewarding the staff of an organization through some kind of incentive will motivate them to actively engage in knowledge sharing and contribute to the organizational development (Casimir, Keith Ng, & Cheng, 2011; Lilleoere & Hansen, 2011).

Moreover, there are numerous barriers that impede effective knowledge sharing in an organization. Some of the key barriers include, but are not limited to, lacking a culture of knowledge sharing in an organization, geographical and physical distances, huge differences in educational and knowledge levels as well as skills and abilities of knowledge holders and knowledge recipients, and strained relationships between the involved parties (Casimir, Keith Ng, & Cheng, 2012; Lilleoere & Hansen, 2011). In addition, another key barrier to knowledge sharing is the perception of “knowledge equals power” (Lilleoere & Hansen, 2011, p. 56). For example, some people believe that knowledge is power and assume that if they know something that other people do not know then they are superior and have more value and power than other people (Goman, 2002). As Wallace (2007) argues, “the truism that 'knowledge is power' dictates that the power of knowledge may be greatest when knowledge is withheld” (p. 110). For the purpose of this study the literature highlights the importance

of the knowledge sharing process in health care practices and the contribution of telemedicine to this process.

Knowledge sharing between various categories of health care practitioners is an indispensable, accepted, and common practice in the medical field across the world. Professional knowledge sharing between health professionals is significant to enhancing the quality and efficiency of patient care in health care facilities (Dwivedi, Bali, & Naguib, 2007; Ryu, Ho, & Han, 2003). Knowledge sharing can be further enhanced by the application of ICT, because ICT can reduce the "temporal and spatial barriers between knowledge workers" (Hendriks, 1999, p. 91). In addition, "information technology fosters collaborations among multiple specialists in several locations via telecommunication, and also provides foundations for organizational learning and knowledge sharing" (Hojabri, Borousan, & Manifi, 2012, p. 1604). Furthermore, telemedicine, which is the application of ICT for health care delivery, and education of medical staff across distance, can play a significant role in knowledge sharing (Curran, Murphy, Abidi, & McGrath, 2009). As Deng and Poole (2003) state, telemedicine not only has the potential to improve accessibility to specialized health care service and reduce travel costs for patients and providers, but it also has the potential to facilitate knowledge sharing and transformation of medical practices among participants across distance. Thus, knowledge sharing and transformation of medical expertise through the telemedicine networks assists learning, improves professional knowledge of health practitioners, and adds value to the quality of health care delivery (Deng & Poole, 2003).

Telemedicine and Health Communication

Effective health communication plays an important role in the delivery of health care services and contributes to the development of both curative and preventive medicine by improving health outcomes of patients with acute and chronic diseases; enhancing the effectiveness of health promotion activities, and supporting assorted public health programs (Schiavo, 2007; Wright, Sparks, & O'Hair, 2008). Health communication is the "study and use of communication strategies to inform and influence individual and community knowledge, attitudes and practices (KAP) with regard to health and health care" (Thomas, 2006, pp. 1-2). The Centers for Diseases Control and Prevention (2011) defines health communication as "the study and use of communication strategies to inform and influence individual decisions that enhance health" (para. 10). Health communication influences the opinion and attitude of individuals and communities toward health care practices as well as improves relationships among health care providers and patients by "raising awareness of common communication issues as well as roles and responsibilities in achieving good health outcomes" (Schiavo, 2007, p. 114; Wright, Sparks, & O'Hair, 2008).

Furthermore, interpersonal health communication is a key element in health communication, which includes communication and interaction among health care providers, patients, and patients' families (Ahmed, 2012). Interpersonal health communication centers on "how interpersonal communication shapes people's health and medical encounters, and how, in turn, people's health and medical encounters shape communication and relationship dynamics" (Ahmed, 2012, p. 148). This study sheds light on the significance of interpersonal health communication between health care providers and patients.

Doctor-patient communication, which is an important aspect of inter-personal health communication, is a process of verbal and non-verbal communication among health care practitioners and patients that enables them to exchange information; build trust and create a favorable therapeutic environment; improve provider-patient relationships and enhance medical decision making; decrease malpractice and increase patient and provider satisfaction; improve psychological well-being and health outcomes (Ahmed, 2012; Miller, 2010; Miller & Nelson, 2005; Schiavo, 2007; Wong & Lee, 2006). Onor and Misan (2005) believe that "doctor–patient communication can significantly influence the attitude of patients toward their well-being, their understanding of medical information, the perception of their diseases, their quality of life, and health status" (p. 103). An important element of physician-patient communication is the medical interview, which assists in the accuracy of the diagnosis and paves the way for an effective relationship between health care providers and patients (Onor & Misan, 2005).

Bakić-Mirić and Bakić (2008) state that “the medical interview, during which doctor-patient communication occurs, is a tool by which the physician gets to know the patient so that he/she feels like a person, not just a medical problem” (p.74). The medical interview requires health care providers and patients to be in the same room, at the same time; however, with the advances in ICT and the advent of videoconferencing this is not an absolute requirement anymore (Onor & Misan, 2005), as “the use of videoconferencing enables a primary care provider and patient at one location to confer with a specialist at a distant site” (Street, Wheeler, & McCaughan, 2000, p. 45). According to Weiner (2012):

> Communication and information technology is changing rapidly worldwide. This digital revolution will have a profound impact on how physicians and health care delivery organizations interact with patients and populations. Over the coming decade, face-to-face patient/doctor contacts will become less common and exchanges between consumers and providers will increasingly be mediated by electronic devices. (p. 1)

Furthermore, Matusitz and Breen (2010) mention, "the use of telemedicine demonstrates that health communication between the patient and the health care provider has been made more rapid and efficient" (p. 295). Notwithstanding, there is growing concern over the influence of telemedicine implementation on the provider-patient relationship in clinical practice, because in a conventional health care practice, practitioners and patients communicate with each other face-to-face in the same location and time (Bulik, 2004). Hjelm (2006) argues that the use of telemedicine causes some breakdown in the provider-patient relationship as well as the relationship between medical professionals. As some of the health care providers in remote areas may perceive telemedicine as a threat to their professional autonomy and may consider themselves as health technicians who act "solely as the hands of the specialists" (p. 147).

In addition, empathy, which is a very helpful psychological approach during medical consultations, enables health care providers to "offer support to patients grappling with strong emotions, such as anger or sadness" (Lussier, 2007, para.1). Williams, Weinman, and Dale (1998) claim that if empathy is higher during medical consultations, then consultations become more patient-centered; as a result, patients' satisfaction rate increases. However, Liu et al. (2007) and Miller (2010) contend that telemedicine consultation builds less empathy and requires longer time than conventional

face-to-face consultations; therefore, health care practitioners may not be able to easily build rapport with patients in remote areas, which will have a negative impact on physician-patient communication and relationship. Miller (2010) argues that telemedicine consultation may not only depersonalize the relationship between health care providers and patients, but it may also negatively impact doctor-patient communication due to limitation in non-verbal communication and the presence of a third party.[17] Moreover, the provider-patient communication style during telemedicine consultation is "more physician centered, with the physician controlling the dialogue and the patient taking a relatively passive role" (Agha, Roter, & Schapira, 2009, para. 5).

Telemedicine in the Developed Countries

According to the World Health Organization (2010), "information and communication technologies (ICTs) have great potential to address some of the challenges faced by both developed and developing countries in providing accessible, cost-effective, high-quality health care services" (p. 6). In the developed world telemedicine has been used as an effective means for increasing access to knowledge, facilitating knowledge sharing between health professionals, and enabling the delivery of quality health care services to isolated and underserved areas (Puustjarvi, J. & Puustjarvi, 2011). According to the World Health Organization (2010) "the majority of telemedicine services, most of which focus on diagnosis and clinical management, are routinely offered in industrialized regions including, but not limited to the United Kingdom … Northern Ireland, Scandinavia, North America, and Australia" (p.10). In order to have a clear view of telemedicine applications in the industrialized

[17] Third party can be other health care practitioners, telemedicine technical staff, chaperones, patient's relatives, and interpreters (The Royal Australian College of General Practitioners, 2010).

countries, this study highlights some aspects of telemedicine networks in Canada, specifically the Ontario Telemedicine Network (OTN).

The OTN is one of the leading and largest non- profit telemedicine networks in the world and is funded by the government of Ontario. The OTN assists in reducing physical distances and spatial boundaries, facilitating communication between health care provider and patients, and expanding knowledge sharing among medical communities through the use of ICT (OTN, 2012). OTN envisions that telemedicine will be an effective tool for medical education and the delivery of health care services. Its mission is "to develop and support telemedicine solutions that enhance access and quality of health care in Ontario, and inspire adoption by health care providers, organizations, and the public" (OTN, 2012, p.3).

The OTN was officially established in 2006 to improve access to quality health care services in Ontario. In the Fiscal Year (FY) 2011-2012, the OTN supported 1,463 health care facilities, including hospitals across Ontario, and equipped them with telemedicine devices. Consequently, the OTN was able to facilitate 204,058 patients to receive telemedicine consultations from 1,685 consultants in various medical specialties, such as psychiatry, addiction, internal medicine, neurology, surgery, pediatrics, and oncology, which resulted in a 45 million Canadian dollars reduction in the travel costs of patients, and an approximated 3.5 million Canadian dollars decline in the management and nursing costs of stroke patients through the application of telestroke in Ontario. In addition to medical care, the OTN supported thousands of educational and administrative events in the FY 2011-2012 in Ontario (Brown, 2012). Deveau (2010) states that besides clinical care, the OTN "is also an

important avenue for delivering distance education and enabling meetings between health care professionals and other partners" (para. 2).

Telemedicine in the Developing Countries

Developing countries face various problems and challenges in terms of the delivery of health care services to their population, particularly to their remote communities. These problems and challenges are not only caused by economic, political, and socio-cultural[18] issues, such as political instability, budgetary problems, poor health infrastructure, ill-functioning transport systems, insufficient roads, and lack of proper communication services, but they are also caused by the poor planning and implementation of their health policies, an inadequate number of hospitals and health care providers, a shortage of qualified health specialists in rural areas, a shortage of adequate essential drugs and diagnostic medical equipment, and poor referral systems among various levels of health care facilities (Awases, Nyoni, Bessaoud, Diarra-Nama, & Ngenda, 2010; Chudi, 2010; Garcia-Betances & Huerta, 2012).

Moreover, in the developing countries unequal distribution of health resources and facilities, high patients-per-doctor ratios,[19] and disproportionate localization of health care providers in urban areas oblige patients in the rural areas to travel to the urban areas to seek medical consultations and assistances. For instance, in Bangladesh "about 70% of total population live in rural areas whereas 75% of total qualified physician are practicing in urban areas" (Hasan, 2012, p. 211; Puustjarvi, J. &

[18] In some of the developing countries a medical doctor is viewed as an expert and it is less likely that he or she will ask another medical doctor for a second opinion because it may be perceived as a "lack of competence" and "dependence on another person" (Wootton, 2008, p. 112).

[19] For instance, in Afghanistan there are two doctors per 100,000 populations; while in the United States of America there are 24 physicians per 100,000 populations (U.S. Global Health Policy, 2012).

Puustjarvi, 2011). Consequently, these problems and challenges impair the availability and accessibility of health care services and lead to health disparities[20] and poor health outcomes in the developing countries (Chudi, 2010; WHO, 2010).

Furthermore, recent advancements and developments in ICT and its adoption into the health system has improved the availability and accessibility of health care services in remote areas by reducing and bridging the physical distances between health care providers and patients who are geographically separated (Ruxwana, Herselman, & Conradie, 2010). Yadav and Poellabauer (2012) believe that "technological advances such as the Internet, mobile and personal communication devices, wireless technologies, and portable sensor devices are continuing to revolutionize the field of health care and wellness" (p. 1). A good example of the use of ICT in the medical field is telemedicine, which can be used for the diagnosis and treatment of patients as well as medical education at a distance. In other words "telemedicine transfers medical expertise instead of medical experts and patients" (Burke & Weill, 2005, p. 60). According to the World Health Organization (2010), telemedicine is "particularly beneficial for rural and underserved communities in developing countries – groups that traditionally suffer from lack of access to health care" (p. 6).

Martinez, Villarroel, Seqane, and Pozo (2004) argue, it is proven that telemedicine has the potential to increase access to health care services to populations in remote and isolated areas in industrialized countries; therefore, it can also be used as a potential means for the delivery of health care services and knowledge sharing in the developing countries, particularly in remote and isolated

[20] "Health disparities are gaps in the quality of health and health care that mirror differences in socioeconomic status, racial and ethnic background, and education level" (NIH, 2013, para. 1).

areas. According to the World Health Organization (2010), one of the greatest advantages of telemedicine is improved access to health care services; thus, the application of telemedicine is very useful for "underserved and developing countries where access to basic care is of primary concern" (p. 13). Moreover, Wootton (2001) claims, it is indisputable that "telemedicine can be used to improve access to health-care in places where there are restrictions, perhaps for reasons of geography or because of shortages of health-care staff… it is in the developing world that such problems are most severe" (p. 1). However, there are several impeding factors that discourage successful implementation of telemedicine in rural areas of developing countries (Puustjarvi, J. & Puustjarvi, 207711). Some of these barriers consist of a lack of electricity in rural areas, scarcity of ICT infrastructure, slow Internet connections, equipment breakdowns, limited finical ability to afford smooth functioning and maintenance of telemedicine networks, and a limited number of trained medical personal to utilize telemedicine (Eccles, 2012; Martinez, Villarroel, Seqane, & Pozo, 2004).

Furthermore, Wootton (2001) contends that "telemedicine is unlikely to be a panacea" (p.3), because telemedicine cannot solve all the health-related problems of the developing countries; however, it is a useful tool among other health interventions and efforts for improving the delivery of health care services when providers and patients are geographically separated. Wootton (2001) further argues that both the developed and developing countries make some common mistakes during the applications of telemedicine, such as "(1) excessive expectations; (2) unsustainable funding models; (3) lack of trials and evaluation data; (4) lack of published results and sharing of expertise" (p. 4).

In addition, the use of sophisticated and very costly ICT equipment is not essentially a prerequisite for initiating a telemedicine project in a developing country, since in developing countries

satisfactory results can be achieved by applying low-cost telemedicine projects (Wootton, 2001). Moreover, low cost telemedicine programs in the developing counties have the potential to be feasible, medically helpful, practical, and sustainable (Wootton, 2008). Additionally, when initiating telemedicine it is important to identify main health problems and gaps that cannot be addressed through conventional medical practice (Filed, 1996; Maheu, Whitten, & Allen, 2001; Whitten, Cook, & Cornacchione, 2011). Therefore, Wootton and Bonnardot (2010) suggest that the best way to initiate and implement telemedicine in a developing country the following points should be taken into consideration:

> (1) Avoid proposing very large and expensive projects; (2) ensure close collaboration with local doctors, national health services or NGOs working in the field...; (3) take into account the published experience of others; (4) start small, and build evaluation into the pilot stage; (5) publish the evaluation results, whether positive or negative; (6) scale up only on the basis of clear success. (p.9)

In brief, in both developed and developing countries there are some significant determinants that contribute to the successful applications of telemedicine. These determinants include, but are not limited to: (1) technology, which requires training and support of telemedicine users, and effective utilization and good quality of telemedicine equipment; (2) acceptance of telemedicine by health care providers and patients, which is a significant factor in the successful implementation and maintenance of telemedicine applications; (3) financing, which includes implementation, operational, and maintenance costs; (4) organisation, which encompasses a clear and concise working guideline and protocol for the use of telemedicine; (5) policy and legislation, which entails standardization to ensure

quality of telemedicine applications as well as suitable security measures to ensure patients' physical security and confidentiality of information (Broens et al., 2007; Buck , 2009).

Theoretical Frameworks

Theories of actor-network (ANT) and diffusion of innovations (DI) are employed as theoretical frameworks to guide this study. The theory of actor-network significantly contributes to the development of new technology by tracing the social and technical relations of the proposed technology (Dankert, 2012; Jones, & Graham, 2003). ANT is "primarily concerned with only one type of action, that is, with how networks and the elements that comprise them co-evolve" (Murdoch, 1998, p. 369). In addition, the theory of diffusion of innovations is one of the most widely used and accepted theories in an information system (IS), which seeks to express how an innovation is adopted and accepted by an individual or organization in a social system (Cho, Mathiassen, & Gallivan, 2008; Robinson, 2009). This theory has been extensively applied as a theoretical framework for the adoption and acceptance of telemedicine in the medical field (Dimmick & Ignatova 2006). Below is the detailed explanation of both theories.

Actor-network theory. Bruno Latour, Michel Callon, and John Law developed the actor-network theory (ANT) in the 1980s (Dankert, 2012). ANT is defined as "a material semiotics grounded in the sociology of science and technology" (Blok & Jensen, 2011, p. 47). Law (2007) states:

> Like other material-semiotic approaches, the actor-network approach thus describes the enactment of materially and discursively heterogeneous relations that produce and reshuffle all

> kinds of actors including objects, subjects, human beings, machines, animals, ‘nature’, ideas, organisations, inequalities, scale and sizes, and geographical arrangements. (p.2)

According to McBride (2003), “ANT suggests that technology is as much a product of social construction as of technical innovation. Technology adoption results from the buildup of fluid networks of heterogeneous associations between actors (both human and non-human)" (p. 266). This theory is widely used in various research fields, including information systems because it assists researchers to better explore and understand the contributions of the social and technological actors in relation to networks (Walsham, 1997). In other words, “ANT is primarily concerned with only one type of action, that is, with how networks and the elements that comprise them co-evolve" (Murdoch, 1998, p. 369).

Networks in ANT are heterogeneous and composed of human and non-human actors, which are strongly entangled and inter-connected (Manning, Wong, & Tatnall, 2012; Murdoch, 1998). ANT does not support the division between the social and technical factors of a network, it treats human and non-human actors equally and impartially, and stresses that both human and non-human actors are equally important (Tatnall, 2012). Moreover, according to Fenwick and Edwards (2010):

> Actor-network theory examines the associations of human and non-human entities in the performance of the social, the economic, the natural, the educational, etc. The objective is to understand precisely how these things come together- and manage to hold together, however temporarily- to form associations that produce agency and other effects: for example, ideas, identities, rules, routines, policies, instruments and reforms. (p.3)

Sohn and Lee (2007) state that non-human actors are composed of “device, information processing, and service technology” (p.2792); whereas, human actors are comprised of “clients, service providers, and network operators" (p. 2792). In the medical field clients are those who receive medical services; service providers are those who play a key role in the delivery of health care services, such as medical and administrative staff; and network operators are the ones who connect clients with service providers (Sohn & Lee, 2007).

Furthermore, Blok and Jensen (2011) mention that "ANT not only examines ‘social’ actors or relations- ANT is interested in any element and any relation that helps to stabilize, or destabilize, a network" (p. 48). An actor is defined as “any element which bends space around itself, makes other elements dependent upon itself and translates their will into the language of its own” (Callon & Latour, 1981, p. 286, as cited in Papadopoulos, Radnor, & Merli, 2010, p. 172), and an actor-network is defined as a “heterogeneous network of aligned interests, including people, organizations and standards” (Walshaman & Sahay, 1999. P. 42). Moreover, the association among human, non-human, and actor networks happen through a process called “translation” (Papadopoulos, Radnor, & Merli, 2011, p. 172).

Cressman (2009) claims that in ANT technology is inter-related with the social world, and in a socio-technical network, the process of translation tries to overcome the separation between technology and the social world. Moreover, according to Wickramasinghe, Tatnall, and Bali (2012), translation is the core concept of ANT in which all the actors negotiate and reach a consensus to determine whether or not a network is useful to be formed and protected. In order to clarify and simplify an actor-network after its creation by several actors through the stage of translation, a

primary or influential actor in an actor-network translates the interests of other actors "into his own, by negotiating with them" (p. 211).

Furthermore, Fenwick and Edwards (2010) state that "translation is the term used by Latour (1987) to describe what happens when entities, human and non-human, come together and connect, changing one another to form links" (p. 9). In ANT interaction among actors is important, because interaction helps actors to establish and maintain connections with one another. To begin and sustain connections actors must be “displaced and transformed in order to make them fit into an actant–network. The work that is necessary to displace and transform is called translation… When actants have not been translated…, they are not part of the actant–network” (Dankert, 2012, p. 48). According to Fenwick and Edwards (2010), the concept of translation in ANT assists in understanding “human motivations to engage or not engage the new technology” (p. 79).

Translation involves four stages. First, problematisation, which is the initial stage of translation, it encompasses identification of the problem and its solution, identification of actors with consistent interests, and establishing roles for all the actors in the network (Mahring, Holmstrom, Keil, & Montealegre, 2004; Wickramasinghe, Tatnall, & Bali, 2012). For instance, in this stage for every “group of actors with similar interests, a primary actor is chosen as the head of the group. This primary actor establishes itself as the obligatory passage point (OPP) between the other actors and the network, rendering it indispensable” (Wickramasinghe, Tatnall, & Bali, 2012, p. 211). Second, interessement, in this stage is where the primary actor works with other actors to convince, through discussion, and accept the proposed problematisation and to negotiate their involvement (Manning, Wong, & Tatnall, 2012; Wickramasinghe, Tatnall, & Bali, 2012). Mahring, Holmstrom, Keil, and

Montealegre (2004) claim that interessement “involves convincing other actors that the interests defined by the initiator(s) are in fact well in line with their own interests” (214). Third, enrollment, includes strategies that enable the actors to accept their roles, which are defined by a focal actor in a network (Mahring, Holmstrom, Keil, & Montealegre, 2004; Manning, Wong, & Tatnall, 2012; Wickramasinghe, Tatnall, & Bali, 2012). Fourth, mobilization, which is the final stage of the translation process, involves initiators that practice “a set of methods to ensure that allied spokespersons act according to the agreement and do not betray the initiators’ interests” (Mahring, Holmstrom, Keil, & Montealegre, 2004, p. 214).

The actors of this project are physicians and neurologists who are likely to share a common interest in treating stoke patients through the use of telemedicine. Hence the actor-network theory provides a useful lens to ascertain whether or not, through this network of telemedicine, physicians and neurologists would be willing to cooperate and share their knowledge and expertise with each other.

Diffusion of innovations theory. Diffusion is "the process in which an innovation is communicated through certain channels over time among the members of social system" (Roger, 2003, p. 5). The theory of diffusion of innovations is one of the most widely used and accepted theories, which seeks to express how technological innovation happens in a social system (Robinson, 2009). Roger (2003) states that “research on the diffusion of innovations started in a series of independent intellectual enclaves during 1940s and 1950s” (p.39). The innovation, communication channels, time, and social system are the four key elements of diffusion of innovation (Roger, 2003).

Innovation encompasses a new concept, experience or object for a person or an organization regardless of when and where it was first discovered and utilized (Dimmick & Ignatova 2006). Innovation is defined as "an idea, practice, or object perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 36). According to the theory of diffusion of innovations there are five characteristics that "influence the rate of adoption of technologies: 1) relative advantage, 2) compatibility, 3) trialability, 4) observability, and 5) complexity" (Cain & Mittman, 2002; Rogers, 2003; Zanaboni & Wootton, 2012, p. 4).

Relative advantage shows the ability of individuals to perceive whether an innovation is beneficial or better than the existing practice. It is one of the key elements of predicting the adoption rate of an innovation (Cain & Mittman, 2002; Rogers, 2003). There are various socio-economic factors that determine the rate of the relative advantage of an innovation. These factors include economic effectiveness, time saving, social prestige, and level of satisfaction, comfort, and convenience with an innovation. Therefore, if the level of relative advantage of an innovation is higher, then it is more likely that the innovation will be adopted rapidly (Cain & Mittman, 2002; Rogers, 2003). Notwithstanding, in a social system all individuals do not adopt an innovation simultaneously. Therefore, Rogers (2003) categorizes adopters as: 1) innovators who are essential in the diffusion of innovation process by showing interest in an initiative; 2) early adopters who may become role models and leaders of a new innovation for others; 3) early majority who adopt ideas prior to the adoption of ideas by other members of a social system; 4) a late majority who accept a new initiative after the early adopters; and 5) laggards who adopt an innovation latter than other individuals in a social system.

Furthermore, compatibility depicts “the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters” (Rogers, 2003, p. 240). If an innovation is compatible and consistent with the necessities, values, and previous experiences of individuals in a social system, then there are greater chances for the rapid diffusion and adoption of such innovation (Cain & Mittman, 2002; Rogers, 2003). Likewise, trialability of an innovation means to experiment with an innovation prior to a major investment or disposal of the existing practices. Trialability requires the experimentation of an innovation on a limited basis with minimal investment and commitment. It reduces the uncertainty of potential adopters pertaining to an innovation and increases the likelihood of its adoption (Cain & Mittman, 2002; Rogers, 2003). An example of trialability in the medical field is the distribution of free sample of new medications by pharmaceutical companies to medical doctors in order to enhance adoption of their new medicines (Cain & Mittman, 2002).

Additionally, observability shows the degree to which potential adopters will observe the results of an innovation. It facilitates the adoption of an innovation, because “the easier it is for individuals to see the results of an innovation, the more likely they are to adopt” (Rogers, 2003, p.16). Moreover, complexity of an innovation describes how difficult an innovation is to be understood and used by potential adopters (Rogers, 2003). Rogers (2003) claims that innovations that have "greater relative advantage, compatibility, trialability, and observability and less complexity will be adopted more rapidly than other innovations" (p. 16). However, in the medical field complexity of an innovation is not a big issue, because medical professionals seem to be relatively pragmatic and center on the clinical value and efficacy of a technology rather than on its simplicity or complexity to apply (Chau & Hu, 2002).

Furthermore, Sanson-Fisher (2004) states that theory of diffusion of innovations is "helpful when determining the adoption of specific clinical behaviors and when deciding which components will require additional effort if diffusion is to occur" (p. 55). Therefore, this theory provides the lens to focus on the diffusion of telemedicine in health care delivery in Afghanistan. The application of the theory of diffusion of innovations as a theoretical framework for this study assists to determine conditions which may facilitate the adoption of telemedicine and identify perceived barriers to the successful adoption and implementation of telemedicine for better management of stroke patients and knowledge sharing among health care providers in Afghanistan (Pereira, Fife, & Schuh, n.d.). In addition, among the characteristics of innovations that elucidate the rate of adoption, relative advantage, compatibility, trialability, and observability help this study to focus on the diffusion and adoption of communication technology in health care system of Afghanistan by providing information about telemedicine and its effectiveness for physicians, neurologists, and policy makers. Moreover, this theory examines how the application of telemedicine influences the social change within the Afghan community of health care providers.

Research Questions

Based on the above literature review on telemedicine, its applications, its potential benefits and perceived barriers in the medical field, the following research questions are posed:

RQ 1: How do medical professionals perceive telemedicine as a means of improving the delivery of health services for stroke patients in Afghanistan?

RQ 2: What is the potential role of telemedicine in knowledge sharing among health care providers in Afghanistan?

Chapter Three: Methodology

This chapter elaborates on the research design and reasons for applying it to execute this research study. Moreover, this chapter explains sampling and data collection methods as well as the data analysis techniques used in the study.

Research Design

This study pursued exploratory qualitative research to obtain information and to better explain the role of telemedicine in the management of stroke patients and its significance in knowledge sharing among health care providers in Afghanistan. Creswell (2007) states, "we conduct qualitative research because a problem or issue needs to be explored" (p. 39). Moreover, Stebbins (2001) mentions that an exploratory qualitative research approach allows the researcher to "explore when they have little or no scientific knowledge about the group, process, activity, or situation they want to examine but nevertheless have reason to believe it contains elements worth discovering" (p. 6). Furthermore, according to Babbie (2004), exploratory research provides a better understanding to the researchers and satisfies their curiosity, and enables the researcher to explore the feasibility of an extensive study. Therefore, this study sought to obtain an insight into the perceptions of Afghan physicians, specialists, neurologists, and officials regarding telemedicine and its potential use in the management of stroke patients and knowledge sharing among healthcare providers in Afghanistan.

Sampling

Neuman (2011) defines a sample as "a small set of cases a researcher selects from a large pool and generalizes to the population" (p. 303). Keyton (2006) claims that in qualitative research design, sampling aims to guide the researcher on who the researcher should recruit for the study, or what the researcher should observe. Neumann (2011) argues that purposive or judgmental sampling is suitable in exploratory research because purposive sampling "uses the judgment of an expert in selecting cases, or it selects cases with a specific purpose in mind" (pp. 331-332). Moreover, in purposive sampling, which is commonly used in qualitative research methods, the researcher chooses participants according to a particular need or purpose, such as research design and objective as well as the target population (Edmonds & Kennedy, 2013).

Similarly, Keyton (2011) states, "purposive sampling is often used when sensitive topics are of research interest or very specialized populations are sought" (p. 132). Accordingly, this study employed purposive sampling to help the researcher recruit Afghan physicians, specialists, and neurologists who were willing and available to be interviewed. The study also employed snowball sampling to recruit policy makers for interviews. The researcher identified an informant and then the informant(s) helped approach other potential participants who were also interested in being interviewed (Buddenbaum & Novak, 2001; Gubrium & Holstein, 2002; Lindlof & Taylor, 2011). In addition, Keyton (2011) suggests that snowball sampling is useful when it is difficult to recruit specific participants, because in snowball sampling "participants help researchers obtain their sample by identifying other similar participants" (p. 131).

Accordingly, the researcher recruited fourteen physicians, specialists, neurologists, and policy makers through purposive and snowball non-probability sampling methods. The inclusion criterion included recruiting those physicians, specialists, and neurologists who have had experience in practicing medicine not only in Kabul city, but also in various provinces of Afghanistan.

The researcher obtained the approval of the Research Ethics Board (REB) of the University of Ottawa prior to travelling to Afghanistan to recruit participants and collect data. During the recruitment process, and before conducting the interviews, the researcher told the participants that their participation in this study was entirely voluntary and they should not expect any compensation for participating in the study. In addition, the participants were told that the researcher would try not to inflict any kind of physical, mental, or socio-economic harm to them, and their rights as informants would be respected. According to Berg and Latin (2004), "among the ethical research rights are informed consent, confidentiality, anonymity, privacy, safe and competent treatment, and knowledge of result"(p. 20). Furthermore, the participants were told that the researcher would adhere to all the other principles of ethics, such as carefulness, integrity, honesty, objectivity, respect for intellectual property, non-discrimination, competence, legality, respect for colleagues, and social responsibility (Resnic, 2010).

Data Collection

This study employed qualitative face-to-face interviews with physicians, specialists, neurologists, and policy makers from the Afghan Ministry of Public Health. One of the most important advantages of face-to-face interviews or personnel interviews is the establishment of rapport between the researcher and the informants during the interview (Gubrium & Holstein, 2002).

According to Jackson, Gillis, and Verberg (2011), "in-depth interviews are done to solicit people's descriptions and explanations of events in their world" (p. 255). Johnson (2002) state that "a researcher who uses in-depth interviewing commonly seeks deep information and knowledge" (p. 104). Hence, an in-depth interview is favored over an informal interview or focus group discussion for studies that aim to obtain deeper information and knowledge (Gubrium & Holstein, 2002; Lindlof & Taylor, 2011). Moreover, in this study, semi-structured interviews were preferred over structured interviews because "semi-structured interviews are often used when the researcher wants to delve deeply into a topic and to understand thoroughly the answers provided" (Harrell & Bradley, 2009, p. 27).

Furthermore, a focus group discussion was not an ideal type of data collection technique for this study, because there is hierarchy in the medical field, such as seniority, level of knowledge and experience, and high organizational status. Thus, there was a concern that one informant would dominate the discussion or even if he or she did not talk a lot, still the presence of a senior specialist, or subspecialist would have prohibited other health care providers from talking openly and freely expressing their ideas. As Westin and Albam (2008) argue, "research on the prestige ordering of medical specialties conducted over many years has shown that medical specialties are informally ordered in a hierarchy" (p.182). Through their study, they ascertained that neurosurgery, thoracic surgery, cardiology, pediatrics, and anesthesia were considered high-ranked specialties, whereas psychiatry, general practice, family medicine, and physical medicine were considered low-ranked specialties (Westin & Albam, 2008).

In brief, the data reported in this research study were gathered through face-to-face semi-structured interviews, ranging from 18 to 43 minutes. Prior to conducting the interviews, the researcher contacted each participant by phone, and later on met with every one of them individually in Kabul, Afghanistan to explain and discuss the research project. The researcher clearly and honestly told every participant about the goal of the study, reasons for his or her recruitment in the study, and how the interview would be held (Lindlof & Taylor, 2011). Informed consent was obtained from all the participants by requesting them to read and understand the purpose of the study and then sign its translated version in Dari language (Cousin, 2008).

The interviews were voice-recorded by a digital recorder to help capture and preserve all the interview discourse. An audio recording assists the researcher in listening carefully and better engaging in the interview, rather than looking down to take notes (Keyton, 2011; Lindlof & Taylor, 2011). Lindlof and Taylor (2011) emphasize the significance of listening for building rapport during the interview and suggest that if a researcher is a good listener, then it is more likely that he or she will elicit more and better information from the interviewees. For this study, each interview took place in a convenient location and time for the participant (Cousin, 2008; Creswell, 2007), because it is significant to "select locations and times that are comfortable and accessible for respondents" (Keyton, p. 288). Twelve interviews were conducted at the private clinics of the participants, and two interviews were held at the residents of the participants at convenient times for them. The interviews were conducted in Dari language,[21] and the researcher asked general and open-ended questions during the interviews (Creswell, 2009). Each interview was transcribed verbatim and then translated word-

[21] According to SAARC Tourism Afghanistan (2009), "official languages of Afghanistan are Dari 50%, Pashtu 35%, Turkic languages (primarily Uzbek and Turkmen) 11%, and 30 minor languages" (para.1).

for-word by the researcher. Verbatim transcription, which includes reproduction of the verbal data by using exactly the same words, is “an important point of transition in the life of a project… once an interview has been transcribed, most of us never return to the audio recording” (Halcomb & Davidson, 2005; Lindlof & Taylor, 2011, p. 211). Furthermore, the researcher used pseudonyms in the final report in order to protect the anonymity of the participants (Keyton, 2011).

Data Analysis

In qualitative research the informal or tentative process of data analysis begins while a researcher collects his or her data; however, systematic data analysis, which includes organization, integration, and examination of collected data, occurs after the data collection (Neuman, 2011; Lindlof & Taylor, 2011). Creswell (2009) states that the process of data analysis in qualitative research "involves preparing the data for analysis, conducting analysis, moving deeper and deeper into understanding the data... representing the data, and making an interpretation of the larger meaning of the data" (p. 183). Neuman (2011) mentions, "to analyze, we connect particular data to concepts, advance generalizations, and justify broad trends or themes" (p. 341). According to Creswell (2007) to analyze data in qualitative research, a researcher must prepare and organize his or her data, then through the process of coding reduce his or her data into themes, and finally represent his or her data in "figures, tables, or a discussion" (p. 148).

In this study, following the data collection using in-depth interviews, a thematic analysis of the transcribed interviews was conducted. Thematic analysis, which is sometimes called “thematic interpretation" (Keyton, 2011, p. 313), enabled the researcher to identify emergent themes from the textual data (Jackson, Gillis, & Verberg, 2011). Glesne (2011) claims that "thematic analysis involves

coding and segregating data for further analysis and description" (p. 184). Therefore, the researcher read the interview transcripts several times to have a clear and better understanding of the data and their meanings. As in thematic analysis, when a researcher conducts, transcribes, translates, and reviews his or her interviews, then his or her familiarity with the data increases (Howitt & Cramar, 2010). Accordingly, in this study in order to analyze the data and identify the main themes, the researcher highlighted those answers of the participants that were relevant to the research and interview questions with various colors on the computer (Lindlof & Taylor, 2011). Later based on the different themes, the researcher categorized and coded the data into various categories and subcategories (Creswell, 2009; Lindlof & Taylor, 2011).

According to Neuman (2011), qualitative coding is an essential part of data analysis and will assist the researcher in organizing and categorizing his or her raw data (Neuman, 2011). Moreover, codes are efficient tools for labeling the data that helps in data retrieval, and it is ideal for performing multiple codings in an exploratory qualitative research in order to analyze and organize textual data (Edmonds & Kennedy, 2013; Miles & Bermanrmas, 1994).

The coding process of this study started with open coding, because "open coding aims at expressing data and phenomena in the form of concepts" (Flick, 2002, p. 177), and it helps to "condense the mass of data into categories" (Neuman, 2011, p. 345). In other words, open coding enables the researcher to examine, compare, organize, and categorize the initial coded themes (Babbie, 2004; Neuman, 2011). Open coding was followed by axial and selective coding. The researcher used axial coding to organize major ideas or themes, identify main concepts, and establish

links between categories (Babbie, 2004; Lindlof & Taylor, 2011; Neuman, 2011). According to Creswell (2007) in axial coding:

> The researcher takes the categories of open coding, identifies one as a central phenomenon, and then returns to the database to identify (a) what caused this phenomenon to occur, (b) what strategies or actions actors employed in response to it, (c) what context (specific context) and intervening conditions (broad context) influenced the strategies, and (d), what consequences resulted from these strategies. (p. 237)

Eventually, selective coding was used to enable the researcher to scrutinize all the previous themes, select the core category, and relate it to other categories in a systematic way (Edmonds & Kennedy, 2013; Neuman, 2011). Flick (2002) states that the aim of selective coding is to elaborate and formulate "the core category around which the other developed categories can be grouped and by which they are integrated" (p. 182).

Furthermore, in order to check the accuracy of the findings and ensure the validity of the study, the researcher employed member checks or member validation. According to Lindlof and Taylor (2002) member validation "means taking findings back to the field and determining whether the participants recognize them as true or accurate" (p.242). Accordingly, the researcher showed the interview transcript to each respondent and discussed the preliminary themes and subthemes with every one of them (Creswell, 2007; Keyton, 2006; Lindlof & Taylor, 2002).

Role of the Researcher

The researcher of this study worked as a practicing physician, for more than 13 years, with different Afghan hospitals and international medical organizations in Afghanistan. Therefore, his work experience may have added value to this study by having a sound understanding of the Afghan health care system, its problems, and challenges. However, the researcher's professional medical background and work experience in surgery, neurology, and internal medicine may have an impact on how he presents his thoughts in the conclusion of this study. Notwithstanding, the researcher has endeavored to be as fair and objective as possible throughout this study. Thus, this study is not a reflection of the researcher's own view about the role of the telemedicine in the management of stroke patients and knowledge sharing among health care providers in Afghanistan. The study reflects the views and perceptions of the participants and all the findings are based on the participants' responses and the reviewed literature for this study.

Chapter Summary

The chapter discussed the research design and methodology employed to perform this research study. This chapter also describes sampling and data collection methods as well as the data analysis techniques used in the study. All fourteen participants in this study were Afghan physicians, specialists, neurologists, and policy makers from the MoPH. Participants were recruited through purposive and snowball non-probability sampling methods. The chapter also provides reasons for employing face-to-face semi-structured interviews, and clearly highlights the recruitment process for this study.

The following chapter reports and analyzes the findings of the study.

Chapter Four: Results and Analysis

The researcher recruited 14 Afghan participants, among whom, two were neurologists, two neurosurgeons, three officials from the MoPH, three specialists from different medical specialties, and four physicians. All of the participants, including the official from the MoPH were licensed medical doctors in Afghanistan. This study was intended to: 1) find out about the major challenges and problems of managing stroke patients in Afghanistan; 2) explore the perceptions of Afghan health professionals on the application of telemedicine as a means of improving the delivery of health services for stroke patients in Afghanistan; 3) understand the perceived barriers to knowledge sharing among Afghan healthcare providers; 4) and ascertain the potential role of telemedicine in knowledge sharing among health care providers in Afghanistan.

As was elaborated in the methodology section, the researcher conducted semi-structured in-depth interviews to collect data (Kvale & Brinkmann, 2009; Miller & Glassner, 2011). Then the transcribed and translated interviews were analyzed using thematic analysis (Howitt & Cramer, 2008; Keyton, 2011), and based on the different themes, the researcher categorized and coded the data into various categories and subcategories (Creswell, 2009; Lindlof & Taylor, 2011). Eventually, the researcher identified three main themes: 1) perceived barriers to stroke management in Afghanistan; 2) perceived barriers to knowledge sharing in Afghanistan; 3) and the participants' perceptions of telemedicine. Each theme had several subthemes; for example, the theme, perceived barriers to stroke management in Afghanistan, consisted of several sub themes, such as organisational, geographic, and socio-cultural barriers. Also, the theme, perceived barriers to knowledge sharing, included two

subthemes, organisational and cultural barriers. In addition, the theme, participants' perceptions of telemedicine, was comprised of two subthemes, participants' perceptions of the role of telemedicine in the management of stroke patients, and participants' perceptions of the role of telemedicine in knowledge sharing.

Perceived Barriers to Stroke Patients Management in Afghanistan

For a better understanding of the current conditions of stroke patients in Afghanistan, respondents were asked about their experience with evaluation, diagnosis, and treatment of stroke patients. Arif, an emergency medicine specialist, stated that on the average every day four to eight acute stroke patients were admitted in the emergency room of their hospital. Similarly, Yarmal, a neurologist in Kabul, mentioned that almost 70 percent of the patients in their neurology ward were stroke patients, among whom, a high percentage suffered an ischemic stroke. When discussing the main causes of stroke in Afghanistan, participants' perspectives revealed several causes of stroke in Afghanistan. Najeeb, an expert in cardiology, explained:

> There are a lot of Rheumatic Heart Disease (RHD) patients in Afghanistan, because children with a sore throat due to streptococcal infections, who remain undiagnosed and untreated, may develop Rheumatic Fever, which can eventually cause RHD. . . . Subsequently, RHD can cause Atrial Fibrillation (AF), which may lead to stroke.[22]

Najeeb further elaborated that old age, disturbances in the regular heart rhythm, high levels of blood cholesterol, high blood pressure, and diabetes are among the main causes of stroke in Afghanistan. Mansoori, an internist and gastroenterologist, also believed that most of the stroke patients that he

[22] "Rheumatic heart disease (RHD) is the most common acquired heart disease in children in many countries of the world, especially in developing countries." According to the Medical Encyclopedia (2012) Rheumatic Fever (RF) is "an inflammatory disease that may develop after an infection with group A Streptococcus bacteria . . . . The disease can affect the heart, joints, skin, and brain (para. 1), and Atrial Fibrilation (AF) is a "common arrhythmic disease where the heart beats rapidly and irregularly" (para. 1).

received in his hospital had a history of high blood pressure or/and diabetes. Several other respondents had similar perceptions. Many participants described various barriers to the evaluation, diagnosis, and treatment of stroke patients in Afghanistan, including organizational, socio-cultural, and geographical barriers.

Organisational barriers. Several participants expressed their concerns regarding numerous organizational problems, such as the lack of necessary diagnostic equipment and tests; the absence of specialized stroke centers in the capital and major provinces of Afghanistan; and the lack of an effective communication system among various levels of health care facilities. They stated that such problems hindered their efforts to properly evaluate, diagnose, and manage their stroke patients. According to Farid, a physician in the regional hospital of Mazar city, Balkh province,[23] one of the major problems in the management of stroke patients in Afghanistan is "the lack of specialized stroke centers with advanced diagnostic technology and well-trained medical personal." Hameed, an official and policy maker from the MoPH, shared similar concerns and declared that "unfortunately, we do not have well-equipped cardiac and neurology centers in Afghanistan." He further stated, "We do not have an adequate number of trained cardiologist and neurologists to respond to the needs of the high numbers of cardiac and neurology patients, including stroke patients, in Afghanistan."

Meanwhile, Wahab, a chief neurosurgeon, stated that the "lack of diagnostic equipment, specially imaging equipment such as Computed Tomography (CT scan) and Magnetic Resonance

[23] According to the World Food Programme (2003), "Balkh province is situated in the northern part of Afghanistan, bordering Uzbekistan in the North, Tajikistan in the North-East, Kunduz province in the East, Samangan province in the South-East, Sar-e-Pul province in the South-West and Jauzjan province in the West" (para. 1).

Imaging (MRI) delay the diagnosis of stroke patients in our hospitals."[24] Therefore, it is difficult for them to diagnose whether their patients have had an ischemic stroke or hemorrhagic stroke. Similarly, Mansoori said that "one of our key challenges in the management of stroke patients is the lack of diagnostic equipment." He added that, they do not have a CT scan machine to diagnose stroke patients in the early hours after their arrival to the hospital. Mansoori further mentioned that head CT scanning "helps them to recognize whether patients have a hemorrhagic or ischemic stroke, and enables them to identify the location and size of the brain lesions. As a result, they can diagnose their stroke patients more rapidly and accurately." Paiman shared similar worries and stated:

> When we receive the stroke patients in our hospital, we send them to other private diagnostic hospitals to get CT scans. And the closest private diagnostic hospital takes four hours just to take the CT scan, and it takes another 10 to 12 hours to receive the radiologist report of the CT scan. Thus, it is almost impossible to start early treatment with thrombolytic agents for our [ischemic stroke] patients, especially in the first three to four hours of the onset of the stroke symptoms.

Similar to Paiman, Reza, a neurosurgeon, also believed that the lack of imaging equipment is one of the main problems in the diagnosis and treatment of stroke patients in Afghanistan. Habib, director of one of the hospitals in Kabul, also shared other respondents' concerns and stated that stroke patients need an immediate CT scan, but unfortunately his hospital does not have a CT scanner. Therefore, they must refer their patients to a private diagnostic hospital for a CT scan, which can take from 12 to 24 and sometimes even 48 hours to receive the report of their CT scans.

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[24] According to the U.S. Food and Drug Administration (2012), "computed tomography (CT) imaging, also known as 'CAT scanning' (Computerized Axial Tomography), provides a different form of imaging known as cross-sectional imaging" (para.2). And Magnetic resonance imaging (MRI) is "a technique that uses a magnetic field and radio waves to create detailed images of the organs and tissues within your body" (Mayo Clinic, 2012, para. 1).

Hameed conceded that due to numerous problems in the diagnosis and treatment of stroke patients in Afghanistan, "nobody is satisfied with the current treatment of stroke patients here [Afghanistan]; therefore, many of the stroke patients are going to other countries for better treatment." He further elaborated that:

> Unfortunately in some parts of Afghanistan, the stroke patients are treated without an accurate diagnosis, and identification of the type and location of the stroke. Hence, the stroke patients are treated empirically and conservatively with a few medications for the control of their high blood pressure, high blood sugar, and so on.

Mansoori commented on the issue of lack of effective communication when they refer their patients to the neurology and neurosurgery wards of the Aliabad hospital.[25] He also stated that "it is difficult to refer our stroke patients to this hospital, because sometimes they refuse to accept and admit our stroke patients in their neurology or neurosurgery wards." Farid also stated that he referred his stroke patients to the Aliabad hospital in Kabul. He expressed similar concerns regarding the lack of an effective communication and patient referral system from the provincial and regional hospitals to the tertiary hospitals in Kabul. He explained:

> It is very difficult for us to refer our stroke patients to Kabul for CT scans and better treatment, because we do not have direct communication with the hospitals in Kabul. We correspond with them through a very brief, one page, referral sheet. We give this referral sheet to the family members or relatives of our patients if they want to take their patients to Kabul. This referral sheet is not a detailed medical record of a patient; it is just a very brief description of patient's symptoms, signs, and the date of his or her arrival to our hospital. Also, sometimes patients or their family members lose this referral sheet on the way to Kabul.

[25] The Aliabad hospital is one of the oldest teaching hospitals in Kabul, which was built in 1933 (Afghanistan Times, 2012.) It has various wards, such as neurosurgery, neuropsychiatry, internal medicine, cardiology, general surgery, and urology. Reza, a neurosurgeon, mentioned that in Afghanistan the first neuropsychiatry and neurosurgery wards were established in this hospital.

Similarly Mansoori added, “I am not satisfied with the services they provide to our stroke patients, because some of the patients whom we have referred to them have come back to our hospital with severe complications, such as total paralysis.” On the contrary, Najeeb, a cardiologist, who works in one of the private cardiac diagnostic hospitals in Kabul, stated that he was satisfied with the working relationship and communication between his and the Aliabad hospital. He claimed that “we have signed a letter of understanding with the Aliabad hospital. Therefore, whenever we refer our stroke patients to them, they admit our patients in their neurology or neurosurgery wards and start the required treatment for them.”

Geographical barriers. Geographic and climatic obstacles were the other main barriers that participants talked about. Some of the respondents described remoteness, difficult mountainous terrain,[26] and snowstorms as some of the barriers, which impeded access to health care services in Afghanistan. Farid said that it can take from a few hours to several days for stroke patients to reach their hospital, because some of their patients come from very remote areas of Balkh and the neighbouring provinces, such as Faryab, Sar-e Pol, Jowzjan, Samangan, Baghlan, Kunduz, and Takhar provinces. He further described, “when we refer our patients to Kabul they face a lot of difficulties in reaching Kabul, especially during the winter months due to harsh snowstorms in the Salang high way.”[27] Similarly, Mansoori also mentioned that the stroke patients "arrive to our hospital from both Kabul and different provinces of Afghanistan. . . . However, some of the patients arrive too

[26] According to the Encyclopedia of Earth (2012) "Afghanistan's terrain is about 75% mountains. The Hindu Kush mountains, considered an extension of the Himalayas, generally run northeast to southwest and divide the northern provinces from the rest of the country, with plains in the north and southwest" (para.1).

[27] "The Salang Pass, at an elevation of 3878 m above the sea level, is the major mountain pass connecting northern Afghanistan and Kabul province, with further connections to southern Afghanistan and Pakistan" (The world's most spectacular roads, 2013, para. 1).

late, especially after they have developed severe complications, and it becomes difficult for us to treat them."

When Qasemi, a senior neurologist, was asked how long it took for his stroke patients to come to his hospital, he responded:

> Early arrival of stroke patients, especially in the first three hours of stroke symptoms is very rare in our hospital, and most of the time patients arrive on the second or third day of their first stroke symptoms. Even in some instances. They arrive after 20 days. Therefore, in my 21 years of professional work as a practicing neurologist, I have not administered intravenous thrombolytic agents to any of my stroke patients yet. However, I am fully aware of the importance and indications of the thrombolytic agents in the treatment of stroke patients.

Socio-cultural barriers. Several participants believed that there were numerous socio-cultural barriers that impeded early arrival of stroke patients to the health care facilities in Afghanistan. For example, Mansoori indicated that some patients and their family members were not aware of the severe complications of stroke. He added that "some of our patients arrive too late to our hospital, because they assume that they will get fine without treatment. But, when they begin to suffer from monoplegia or paraplegia, then they come to our hospital."[28] Similarly, Farid, who practiced medicine in Mazar-e Sharif regional hospital,[29] mentioned that in Balkh and the neighbouring northern provinces, there is lack of awareness among stroke patients and their family members about the presenting symptoms of stroke, its risk factors, and complications; therefore, patients and their family members do not seek urgent medical assistance, especially in the first few hours after the onset of stroke symptoms. Farid further added that "patients' family members do not bring their patients to the

[28] Monoplegia means "paralysis of one limb" (Right Diagnosis, 2011, para. 1).
[29] Mazar-e Sahrif regional hospital is located in the capital of Balkh province and is "the only referral hospital in northern Afghanistan, serving seven provinces with a population of nearly five million" (Deutsche Gesellschaft fur International Zusammenarbeit [GIZ], para. 3, n.d.; MoPH, 2012).

hospitals in the early hours of stroke symptoms. They bring them when their patients' conditions get worse." Najeeb also believed that lack of knowledge and awareness about the stroke symptoms along with some traditional cultural practices prevent families from bringing their patients, especially female patients, to the health care facilities.

Several other participants had similar perspectives. For instance, Paiman conceded that "unfortunately, in Afghanistan, there are many cultural problems that when some patients suffer a stroke, prior to taking them to the medical facilities, their family members and relatives take them to different shrines." Qasemi recalled his memories of several stroke patients who were taken to shrines for cures prior to bringing them to his hospital. He described that in those shrines patients were put on strict dietary regimens and due to such strict dietary restrictions, some of the patients had developed other serious diseases, such as acute renal failure, increased intracranial pressure, aspiration pneumonia and many other severe complications.[30] Similarly, Arif, an emergency medicine specialist, said:

> This morning I had a stroke patient in the hospital that developed stroke symptoms three days ago, but his family members first took him to a shrine for a cure. Then the family members were told and encouraged by other relatives and neighbours to take the patient to a hospital. So, when we received him in our hospital we measured his vital signs and his blood pressure was 185/ 105 mm Hg, and then after our clinical assessments and CT scan report, it was diagnosed that he suffered an ischemic stroke.

[30] "Acute renal failure (ARF) has traditionally been defined as the abrupt loss of kidney function that results in the retention of urea and other nitrogenous waste products and in the dysregulation of extracellular volume and electrolytes" (Palevsky, 2013, para. 1). According to the Medical Encyclopedia (2011), "an increase in intracranial pressure is a serious medical problem. The pressure itself can damage the brain or spinal cord by pressing on important brain structures and by restricting blood flow into the brain"(para. 2).

Many participants also considered the poor economy, insecurity, low literacy and health literacy[31] levels, lack of an effective transportation system, and lack of medical ambulance services among the key challenges for stroke patients in seeking medical assistance. Farid mentioned that "due to security and transportation problems in some of the provinces, stroke patients arrive very late to our hospital." He also stated that some "patients are extremely poor and cannot afford the transportation costs to come to our hospital." Najeeb also believed that people who lived in the remote areas of Afghanistan did not have easy access to transportation. Thus, in case of medical emergencies, it would be difficult for them to go to medical centers in time. Similarly, Reza claimed that "patients from the rural areas of Afghanistan arrive very late to their hospital because of the transportation problems. And some patients may even die during transportation from their provinces to Kabul."

Najeeb believed that lack of health information and low level of health literacy has negatively impacted the health and well-being of the population of Afghanistan, especially in the remote rural areas. He claimed that:

> A number of the Afghan people do not have adequate access to health information, and even if they have access to health information, it would be difficult for them to understand the information properly, because of the low literacy and health literacy levels.

Similarly, Paiman stated that the health literacy level of rural Afghan people is low; therefore, in some areas when patients develop stroke symptoms, instead of going to medical centers, they are first self-medicated and self-treated at their homes, and sometimes they are taken to some holy places and shrines for cures.

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[31] World Health Organization (2013) defines health literacy as " the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health" (para.1).

In brief, participants' perspectives revealed several causes of stroke in Afghanistan, which include high blood pressure, high levels of blood cholesterol, diabetes, rheumatic fever, rheumatic heart disease, and disturbances in the regular heart rhythm. Moreover, many respondents highlighted various barriers to the evaluation, diagnosis, and treatment of stroke patients in Afghanistan, including organizational, socio-cultural, and geographical barriers.

Perception of Knowledge Sharing among Health Care Professionals in Afghanistan

Several respondents expressed their perceptions of knowledge sharing and its significance in the medical field. From the perspectives of many participants, knowledge sharing among health care providers is vital for enhancing the professional knowledge of health care providers and improving the quality of patient care. For instance, Farid stated that "in order to share our knowledge with our colleagues, we hold medical conferences on various medical topics once a week in our hospital, and through these medical conferences we share our knowledge with other colleagues." Majeed, a senior general surgeon, also mentioned that he shared his new laparoscopic surgical procedures not only with his trainees and other surgeons in his hospital, but he also shared them through his Facebook page with hundreds of other surgeons across Afghanistan. Majeed gave an example of his motivation for knowledge sharing and said:

> During my first trip to the United States, I began to understand that knowledge sharing and seeing new surgical procedures as well as learning from others is very important. I have realized that some of the reasons for the advancement and developments of the medical field in the developed countries are because of the culture of knowledge sharing among their health care providers.

Similarly, Reza also expressed that knowledge sharing motivated him to work hard, read more, and learn new surgical procedures. Yarmal also said that "we learn more when we share our skills and knowledge with each other."

Some of the participants also talked about some of the organisational and cultural barriers to knowledge sharing and training of medical staff within the health care system of Afghanistan. In addition, several other participants mentioned a lack of security, geographical problems, and the underutilization of ICT in the Afghan health sector as some of the main obstacles to knowledge sharing and training of health care providers in Afghanistan. Hameed conceded that "we are still using very old traditional training methods to train our medical staff." He further declared that "we have not been able to use ICT in the medical field effectively, especially for knowledge sharing and training of our medical staff." Similarly, Majeed claimed that shortage of required surgical equipment for advanced laparoscopic surgeries impeded his intentions for performing some of the laparoscopic operations, which he acquired and mastered abroad. He showed signs of discontent when he was unable to fully utilize his knowledge and expertise and share them with other surgeons.

Many participants were asked how often they attended Continuing Medical Education (CME) programs. Many participants stated that they did not attend any CME programs after their postgraduate training. For instance, Yarmal mentioned that "we do not have any opportunities to participate in any CME programs inside or outside Afghanistan." Similarly, Farid declared that "we just had our postgraduate training and since then expect weekly or monthly medical presentations and conferences in our hospitals we have not participated in any CMEs." Mansoori also indicated, "I rarely participated in the CMEs, since we do not have regular CMEs in Afghanistan. However, we

have morning rounds and weekly presentations that help us exchange our views with each other on specific patients or medical topics."

Nonetheless, Majeed had participated in several CMEs and stated that despite economic constraints he managed to participate in a few overseas CMEs in Korea and Egypt, and paid some of the travel expenses. He further described that "in some of the overseas CMEs we have to cover some of the expenses, such as travel and lodging costs." Majeed further added that he had been taking advantage of the online medical educational programs too.

Wahab, a senior neurosurgeon, also addressed the lack of transparency in the allocation of overseas fellowships and scholarships to the medical staff by the MoPH. He claimed that last year there was a short term fellowship for a neurosurgeon to receive training in Italy. He nominated one of his neurosurgeons for this fellowship, but unfortunately "the MoPH sent an administrative staff member from the ministry [instead of a neurosurgeon] to that fellowship." Hamayoon considered the lack of security a major obstacle in conducting CMEs and other educational programs in some of the remote areas of Afghanistan.

Another key concern of the participants was the notion of professional jealousy in some of the Afghan hospitals. Majeed expressed his concerns over the perceptions of some health care providers who preferred not to share their knowledge with others. He claimed:

> There are some professionals who keep their skills and knowledge concealed and do not disclose and share it with others. They refrain from teaching and training others. Unfortunately, this practice of avoiding knowledge sharing is still somehow prevalent in our country and some professionals do not want to share their professional knowledge with other medical staff. I think such professional jealousy was very common in the teaching hospitals and they [the trainers] were reluctant to share their knowledge and skills with others [the trainees]. For example, some of the Afghan doctors who were educated in other countries did not want to share their knowledge with other doctors . . . . They were thinking that they were more knowledgeable experts than others, and knowledge sharing would reduce their importance in the hospital.

Hameed recalled his memory of the professional jealousy and illustrated with the following example:

> When I graduated from the medical university, I started working as a neurosurgeon in the neurosurgery department of one of the hospitals in Kabul. One day, in my early days of work, I asked the chief neurosurgeon of the hospital about the level and location of the lesions on one of our traumatic brain injury patients, who was suffering from paraplegia of the lower limbs due to a penetrating gunshot injury of the head. He [the chief neurosurgeon] looked at me in surprise and told me that the patient has a head gunshot injury and that is why he has paraplegia of the lower limbs. And you do not care about the level and location of the lesions, and so on. Since that day I have stopped questioning the chief neurosurgeon of the hospital, although I had plenty of questions to ask.

Similarly, Wahab, a chief neurologist, highlighted some of the religious aspects of knowledge sharing and stated that:

> I am against the idea of not sharing my knowledge and skills with others, because from the scientific and religious point of views you are discouraged from keeping your knowledge and not sharing it with others. For example from my religious point of view, if I perform a surgical operation on a patient, I may be rewarded for helping a patient or saving a life, but if I teach this operation to another surgeon then the rewards may be even more, because the surgeon whom I train will be able to save hundreds of more lives.

In summary, many respondents believed that knowledge sharing among health care providers was vital for enhancing the professional knowledge of health care providers and improving the quality of patient care. Nevertheless, some participants talked about the challenges and obstacles to knowledge sharing in the medical field in Afghanistan, such as organizational and cultural barriers, geographical problems, security concerns, and the underutilization of ICT in the Afghan health care system.

Afghan Health Care Providers' Perceptions of Telemedicine

When participants were asked about their perspectives of telemedicine, some of them stated that they had only heard about telemedicine and never seen its practical applications. For instance,

Yarmal said, “I have heard about telemedicine, it enables doctors to assist patients in remote locations.” Farid believed that “telemedicine is a technology that assists communication between clinical care providers and patients at a distance.” Majeed knew how telemedicine works. He recalled his first memory of telemedicine and stated:

> Last year I travelled to Pakistan to sign an official contract between our hospital and the Alshefa hospital in Pakistan. And, I watched how they were using telemedicine in Pakistan. They were using telemedicine to stay connected with some of their medical centers, which were located far from their main hospital.

Majeed also thought that telemedicine may play a significant role in the medical field in some of the developing and poor countries. He believed that in some of the developing and poor countries of the world, like Afghanistan, medical facilities and resources, including professional medical personal, are limited and do not appropriately respond to the needs of their populations. Hameed stated that he was not an expert in the field of telemedicine; however, he envisioned the effectiveness of telemedicine in Afghanistan by giving the following example:

> If a surgeon in the remote provinces of Afghanistan, such as Ghor or Badakhshan, needs to consult with a radiologist or an orthopedic surgeon regarding an orthopedic radiologic imaging, then this will be possible through the use of telemedicine…. But if he [the provincial health provider] does not have access to telemedicine, then I am sure that his patient will remain in that remote province for a long time, because it may not be possible or cost-effective for most of the patients to travel by airplane to Kabul. In addition, if a patient with fractured bones is transported by road, then due to bad road conditions and transportation problems, it is possible that the patient’s fractured bones will mobilize and cause further complications, such as ruptured arteries, veins, and damaged nerves.

Apparently, a number of participants' perceptions of telemedicine were limited to the use of videoconferencing for medical consultation and education among health care providers or health care facilities in Afghanistan or across borders. For instance, Reza described that telemedicine facilitated

connection and communication between two health care providers or health centers via videoconferencing. Some of the respondents, who were senior specialists in their fields, were talking about providing second opinions and medical consultations to some physicians in different provinces of Afghanistan via their mobile phones. For example, Wahab, a chief neurosurgeon, stated that he was able to assist and save the lives of several patients in one of the remote provinces in northern Afghanistan by providing medical consultation on different neurosurgery patients to an orthopedic surgeon in that province. Similarly, Yarmal mentioned that he provided neurology consultations to several physicians in various provinces of Afghanistan. He further mentioned that when these physicians "need our advice or consultation on particular neurology patients, they call us and present the symptoms, signs, and laboratory findings of their patients to us, and then we provide our opinions to them and instruct them what to do." Arif had a similar point of view and commented, "I provide consultation to some physicians in the provinces through my mobile phone. The practicing physicians in those provinces call me and present the symptoms and signs of their patients, and then I give them the necessary instructions and recommendations." For the purpose of this study, respondents' perceptions of telemedicine were categorized into two sub-categories: 1) perceptions of telemedicine in the management of stroke patients and 2) perceptions of telemedicine in knowledge sharing.

In short, all the respondents were aware of telemedicine and its clinical applications. They have either seen or heard about telemedicine and its potential advantages in various medical fields. However, a number of participants' perceptions of telemedicine were limited to the use of videoconferencing for medical consultation and education among health care providers or health care facilities across distances, and despite being engaged in providing medical consultations with other

health care providers in the remote areas through their cell phones, they did not consider the use of mobile phones for medical consultations as an application of telemedicine.

Participants' Perceptions of Telemedicine in the Management of Stroke Patients

Several participants believed that the application of telemedicine for the management of stroke patients would be a positive step in the health care system of Afghanistan. They assumed that the application of telemedicine would assist them in saving the lives of their stroke patients by diagnosing and treating them in time, and preventing further complications. Qasemi stated that if telemedicine was used for the management of stroke patients in Afghanistan, it would be "as if the neurologist is next to the bed of a stroke patient" and for the patient it would be "like he is hospitalized in a neurology ward in Kabul and receives the same level of care and attention as the other stroke patients receive in Kabul." Qasemi further added that the "use of telemedicine will revolutionize the medical field in Afghanistan, because through the use of telemedicine even a nurse in the remote areas will be as efficient as a medical professor [expert medical staff]." Similarly, Yarmal thought that use of telemedicine for the evaluation, diagnosis and management of stroke patients, would be just as though a neurologist is traveling in a short period of time to a remote area of Afghanistan to help a stroke patient. Yarmal further elaborated on the possible positive psychological effects of telemedicine on stroke patients in the remote areas of Afghanistan and claimed that if a stroke patient in one of the remote provinces of Afghanistan is treated through a telemedicine consultation, then the patient might be less concerned about his treatment and may not think that he would have received better treatment if he had gone to Kabul.

Some other participants talked about the transportation and road problems and their negative consequences on the timely arrival of stroke and other time-sensitive medical emergencies to the medical facilities in Afghanistan. For instance, Hamayoon, an official from the MoPH, stated that "patients in most of the provinces have more problems compared to patients in Kabul. . . . [Because] the diagnostic and therapeutic facilities that are available in Kabul, are not available in the provinces." Therefore, he believed that it would be a constructive step to incorporate telemedicine into the health care system in Afghanistan. He added that "patients from the remote provinces cannot easily travel to Kabul to receive specialized healthcare service due to geographical and transportation problems. Therefore, the application of telemedicine will enable them to receive specialized health care services in their own provinces." Paiman also expressed his views and stated that:

> I think telemedicine will be more effective in the management of stroke patients in Afghanistan compared to other developing countries, because there are numerous problems in the management of stroke patients in Afghanistan. On the one hand, we do not have the required diagnostic equipment as well as adequate number of specialists and trained medical personal to diagnose and treat stroke patients in the remote provinces of Afghanistan. On the other hand, we have mountainous terrain and numerous transportation problems, which delay our patients' timely arrival to Kabul.

Yarmal shared similar perceptions and indicated that a number of the stroke patients in Afghanistan, especially those patients who live in the remote provinces, cannot afford to travel to Kabul to get specialized treatment. Therefore, "if telemedicine is utilized in Afghanistan, it will help them [the stroke patients] to be treated in their provinces and they will not need to travel to Kabul and can save their money too." Yarmal also talked about the potential significance of telemedicine in the

management of stroke patients by exemplifying that "if we use telemedicine for our stroke patients in Afghanistan, then Zabul will be like Kabul to them."[32]

Qasemi had similar comment, "if we provide our opinions and instructions on stroke patients to other physicians who work in the provinces, via telemedicine, then it will be just as if we are physically there to assist the patients." Similarly, Hamayoon shared Yarmal and Qasemi's perceptions on the potential benefits of telemedicine for the stroke patients in Afghanistan and indicated that "telemedicine will pave the way for the timely diagnosis and management of stroke patients even when patients are far from the specialists." Reza also mentioned that due to economic and transportation problems, it would be very difficult for stroke patients to travel from the remote provinces of Afghanistan to Kabul. Therefore, Reza pointed out that "telemedicine will possibly play an important role in the evaluation and management of stroke and other emergency patients in Afghanistan."

Another participant, Wahab, shared his concerns about the incompatibility of stroke patients' health conditions with long trips and remarked that several of the stroke patients died on the way to Kabul, because long road trips were too risky for such patients, due to the bad road conditions, transportation problems, and lack of ambulance services. Therefore, he expected that the use of telemedicine in the diagnosis and treatment of stroke patients would be very helpful in Afghanistan.

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[32] Zabul province is located in southern Afghanistan and the majority of its inhabitants "96.7 percent" resides in rural areas" (Central Statistics Office, 2005, p.2).

Some participants expressed concern that telemedicine would not be helpful in the management of stroke patients unless diagnostic equipment such as MRI and CT scan machines are available in the district or/and provincial hospitals of the remote provinces, since this diagnostic equipment is needed to properly diagnose stroke patients. Reza stated that "telemedicine can be helpful in the management of stroke patients in Afghanistan if the required diagnostic equipment and laboratory tests for the diagnosis of stroke patients are also available in those provinces." Yarmal had similar concerns and believed:

> If we have CT scan and other diagnostic facilities in the provinces then telemedicine will be very effective in the management of stroke patients, because imaging diagnostic findings, and our clinical evaluation and assessment of stroke patients will help us to diagnose and treat the stroke patients in the remote areas of Afghanistan through telemedicine.

Wahab showed optimism about the availability of imaging diagnostic equipment in a few major provinces of Afghanistan. He stated that:

> I heard that some private hospitals are trying to buy imaging equipment such as MRI and CT scan in Mazar [Balkh], Herat, and Kandahar provinces. So once we have imaging diagnostic equipment in these provinces, then it will be possible for us to help stroke patients in their provinces. And, they will not have to spend money to come to Kabul to consult with us.

Similarly, Hameed expressed his optimism about the recent plans of the MoPH to improve the medical situation in Afghanistan and provide diagnostic imaging and other sophisticated medical equipment and services through the initiative of private-public partnership in the health sector of Afghanistan.

Briefly, several participants believed that the application of telemedicine for the management of stroke patients would be a positive step in the health care system of Afghanistan. They perceived that the use of telemedicine would help them in saving the lives of their stroke patients by diagnosing

and treating them in time, and preventing further complications. However, some participants considered the availability of imaging diagnostic equipment, such as MRI and CT scan machines in the provincial hospitals, as a prerequisite for the effective utilization of telemedicine in the management of stroke patients in Afghanistan.

Participant's Perceptions of the Role of Telemedicine in Knowledge Sharing

Almost all the respondents expressed their enthusiasm for utilizing telemedicine to share and exchange their knowledge and skills with other health care providers across distances. Many participants brought several examples about the potential role of telemedicine and its contribution to knowledge sharing and knowledge development in Afghanistan. Hamayoon described his views on the importance of knowledge sharing in the medical field in Afghanistan by declaring that "if Afghan health care providers share their knowledge and expertise with each other, they will improve the quality and outcomes of their work, and will bring more strengths and positive changes into their organizations." When Mansoori was asked whether telemedicine would create a favorable environment for knowledge sharing and exchange of views, he responded:

> I think that telemedicine will be very useful to exchange and share our experiences and knowledge with other doctors and learn from each other . . . .[Because due to years of civil war and conflicts] Afghan doctors have been deprived of access to recent advancements and developments in the medical field. They do not have access to recent medical textbooks, journals and lectures. I think telemedicine will play an important role in knowledge sharing and improving our professional knowledge and skills.

Similarly, Qasemi mentioned that "telemedicine will possibly be effective in knowledge sharing, because the exchange of views and consultation between two health providers would pave the way for knowledge sharing and both physicians and specialists can learn from one another." Hamayoon

believed that the consultation and exchange of professional information would not only be helpful for the management of the stroke patients, but it would also be effective for the physicians and specialists to acquire new skills and knowledge from each other.

Yarmal described how the recent advances and developments in the information and communication sector in Afghanistan have reduced professional jealousy among health care providers. He claimed that:

> In the previous years the economic condition of some of the doctors was not good and they were not able to buy medical books from abroad to keep their medical knowledge current. So when a doctor had access to recent medical books then he was the king [aware of the recent medical advances and developments] in the hospital. . . . However, after the arrival of the Internet in Afghanistan, this professional jealousy has reduced, because in our hospital most of the doctors search and study medical topics on the Internet and then discuss and share the new information with other doctors.

Similarly, Wahab pointed out that telemedicine would facilitate knowledge sharing among health care providers in Afghanistan by creating a favorable and conducive environment for the exchange of professional knowledge and expertise among health care providers. Like Wahab, Habib also shared his perception about the potential role of telemedicine in knowledge sharing and knowledge transfer among the health staff in Afghanistan; he predicted that "telemedicine will benefit our patients as well as our health care providers. Because when specialists examine and consult patients through telemedicine at a distance, then they share their knowledge with the primary health care providers too." Arif also mentioned that:

> If we share our professional information and skills via telemedicine with those health care providers that practice medicine in the remote and isolated areas of Afghanistan, then we will be able to overcome the main challenges, which threaten the health and well-being of our people in those areas.

The majority of the participants, who were practicing medicine in Kabul, were in favor of being connected with overseas specialists and medical centers through the cross-border telemedicine. Hameed described that "if we get connected with specialists in India or other European countries . . . by means of telemedicine, then it will help us tremendously both in the treatment of our patients as well as training of our medical staff." Similarly, Mansoori said:

> By connecting and communicating with overseas medical experts through telemedicine across borders, we will be able to better assist some of our more severe patients, who have to travel to the neighboring countries for more advanced laboratory and diagnostic tests and better treatment.

Reza also shared Mansoori's perspective on the benefits of cross-border telemedicine for Afghanistan. Mansoori elaborated that:

> Many of our severe and complicated patients, who can afford it, are going to Pakistan and India for treatment. If our hospitals are connected via telemedicine with well-equipped and modern hospitals or centers of other countries, then we will be able to ask the experts of those hospitals or centers for consultation and a second opinion about our severe and complicated patients.

He further added that "connection with another overseas hospital through telemedicine will not only enable us to diagnose and manage most of our complicated and severe patients in Afghanistan, but it will also assist us in acquiring new knowledge and expertise from them." Similarly, Yarmal had the same impression about the potential advantages of the application of telemedicine across borders. He indicated that "if we are connected with specialists from other countries through telemedicine or medicine at a distance, then we will be able to seek their opinions and consultations about the diagnosis and treatment of some of our severe patients."

Respondents were also asked whether or not they were willing to use telemedicine and help other health care providers who practice medicine in the remote areas and provinces of Afghanistan. Many participants responded that they were eager to help patients in the remote provinces as well as share their knowledge with other health care providers through telemedicine. Mansoori said that he was ready to train other doctors in the provinces and train them in gastroenterology and share his knowledge and skills with them. Similarly, Yarmal mentioned that:

> I will be proud and happy to help stroke patients via telemedicine in the most remote areas of Afghanistan. My primary motivation for becoming a medical doctor was only to serve human beings. So it will be a great honor and pleasure for me if I can serve stroke or any other neurology patients in the most remote areas of Afghanistan via telemedicine that otherwise I will not be able to reach and assist them.

Reza also believed that "if we have telemedicine in Afghanistan I will be pleased and ready to share my knowledge in neurosurgery with other doctors and assist them in treating their patients." Hamayoon shed light on how to motivate and actively engage medical and non-medical staff in a possible telemedicine project in Afghanistan; he added:

> Motivation has several modules. Staff can be motivated by receiving some kind of monetary incentive or their work should be admired, rewarded, and acknowledged by some sorts of appreciation, such as professional development. I think every kind of motivation has its own importance and should be considered during the planning and implementation stages of a telemedicine project in Afghanistan. For instance, a monthly incentive may be a good motivator to encourage the medical and non-medical staff members who are involved.

Arif also stated that "I am ready to help patients and train other doctors through telemedicine without any financial rewards or other kinds or incentives."

In brief, several respondents were optimistic about the potential role of telemedicine and its positive contribution to knowledge sharing and knowledge development in Afghanistan. Also, several

participants revealed their willingness to use telemedicine for sharing and exchanging their knowledge and skills with other health care providers across distances.

Chapter Summary

This chapter presented the findings of the fourteen face-to-face semi-structured interviews conducted with the Afghan physicians, specialists, neurologists, and officials of the MoPH. The results ascertained three main themes, which included perceived barriers to stroke management in Afghanistan, perceived barriers to knowledge sharing in Afghanistan, and the participants' perceptions of telemedicine. Each theme had several subthemes. The theme, perceived barriers to stroke management in Afghanistan, consisted of several sub themes, such as organisational, geographic, and socio-cultural barriers. Also, the theme, perceived barriers to knowledge sharing, included two subthemes, organisational and cultural barriers. In addition, the theme, participants' perceptions of telemedicine, was comprised of two subthemes, participants' perceptions of the role of telemedicine in the management of stroke patients, and participants' perceptions of the role of telemedicine in knowledge sharing

The following chapter is a discussion of the findings obtained from the respondents' interviews. It addresses the two main research questions of the study, which were posed in chapter two. The results are also compared, analyzed, and discussed in relation to the reviewed literature for this study, and guided by the theories of actor-network and diffusion of innovations which provided a theoretical framework for this investigation.

Chapter Five: Discussion

This section discusses the findings of the study in relation to the two main research questions, which were initially posed in the study and were guided by the Actor-network (ANT) and Diffusion of Innovations (DI) theories. In addition, this section compares and analyzes the findings from the respondents' interviews and with the literature review of this investigation. The purpose of this study was to explore the role of telemedicine in the management of stroke patients and knowledge sharing among health care providers in Afghanistan. The study focuses on the use of telemedicine as a means, among other efforts, for better delivery of health care services to stroke patients, especially those patients who live in remote areas where specialized health care services are limited. Therefore, based on the existing literature regarding telemedicine, its applications, its potential benefits and the perceived barriers in the medical field, the following two research questions were posed:

RQ 1: How do medical professionals perceive telemedicine as a means of improving the delivery of health services for stroke patients in Afghanistan?

RQ 2: What is the potential role of telemedicine in knowledge sharing among health care providers in Afghanistan?

The researcher conducted face-to-face semi-structured interviews to find answers to these two research questions and to obtain insights into the perceptions of Afghan physicians, specialists, neurologists, and officials regarding telemedicine and its potential use in the management of stroke patients and knowledge sharing among healthcare providers in Afghanistan. Therefore, the interviews in this study concentrated on four key areas: 1) the major challenges and problems of managing stroke

patients in Afghanistan; 2) the perceptions of Afghan health professionals on the application of telemedicine as a means of improving the delivery of health care services for stroke patients in Afghanistan; 3) the perceived barriers to knowledge sharing among Afghan healthcare providers; 4) the potential role of telemedicine in knowledge sharing among health care providers in Afghanistan.

Actor-network and Diffusion of Innovations Theories as a Theoretical Framework

According to the ANT, "technology adoption results from the buildup of fluid networks of heterogeneous associations between actors (both human and non-human)" (McBride, 2003, p. 266). In other words, ANT does not support the division between the social and technical factors of a network, it treats human and non-human actors equally and impartially, and stresses that both human and non-human actors are equally important "as actors within a network" (Cressman, 2009, p. 3; Tatnall, 2012). Thus, in the ANT interaction among actors is important, because interaction helps actors to establish and maintain connections with one another through the concept of translation, which helps actors to begin and sustain connections with each other (Dankert, 2012; Fenwick & Edwards, 2010). Moreover, the associations among human, non-human, and actor networks happen through a process called "translation" (Papadopoulos, Radnor, & Merli, 2011, p. 172). According to Fenwick and Edwards (2010), the concept of translation in ANT assists in understanding "human motivations to engage or not engage the new technology" (p. 79). Accordingly, adoption of telemedicine in Afghanistan may involve various actors, such as the Ministry of Public Health, Ministry of Communications and Information Technology (MCIT), opinion leaders and experts in the health care system of Afghanistan, and international donors. Hence the actor-network theory, particularly the concept of translation, provides a useful lens to ascertain whether or not, through this network of

telemedicine, physicians, neurologists, and policy makers from the MoPH, and MCIT would likely cooperate with each other to form a telemedicine network and utilize telemedicine as a means among other efforts for better management of stroke patients and knowledge sharing among health care providers in Afghanistan.

Moreover, according to Harnett (2006), successful implementation of a telemedicine program not only requires the necessary ICT equipment, but it also requires committed, trained, and skillful personal (Harnett, 2006). The findings of this study revealed that, many respondents showed a readiness and willingness to use telemedicine and assist other health care providers in the remote areas and provinces of Afghanistan. For instance, Yarmal, a neurologist in Kabul, mentioned that he would be honored and pleased to assist stroke patients, through telemedicine, in the most remote areas of Afghanistan. He added that his primary motivation for becoming a medical doctor was only to serve human beings. Therefore, it would be a great honor and pleasure for him to serve stroke or any other neurology patients in the most remote areas of Afghanistan that he would otherwise not be able to reach and assist, via telemedicine. Similarly, Reza, a neurosurgeon, also expressed his willingness and commitment to help stroke patients in the remote areas of Afghanistan via telemedicine without expecting any financial incentives or rewards. In addition, Hameed, a senior official from the MoPH, stated that he asked a team of experts from the MoPH to negotiate with the officials from the MCIT to pave the way for the integration of ICT into the health care system of Afghanistan. He further added:

> I have assigned a team at the Ministry of Public Health to develop a strategy on how to incorporate information and communication technology into the health care services in Afghanistan . . . since I have started my new job as a deputy minister, I have been working on this initiative, and I hope to have a guideline and better way to use this technology [ICT] maximally.

In addition, according to the theory of diffusion of innovations, there are five characteristics that "influence the rate of adoption of technologies: 1) relative advantage, 2) compatibility, 3) trialability, 4) observability, and 5) complexity" (Cain & Mittman, 2002; Rogers, 2003; Zanaboni & Wootton, 2012, p. 4). Relative advantage shows the ability of individuals to perceive whether an innovation is beneficial or better than the existing practice. It is one of the key elements of predicting the adoption rate of an innovation (Cain & Mittman, 2002; Rogers, 2003). The findings of this study revealed that, many participants perceived the relative advantage of the application of telemedicine and believed that the application of telemedicine would assist them in saving the lives of their stroke patients by diagnosing and treating them in time, and preventing further complications. Therefore, based on the existing organizational, socio-economic, transportation, security, geographic, and climatic problems, which hamper the timely management of stroke patients in Afghanistan, many participants considered the potential use of telemedicine as a constructive step in the medical system in Afghanistan. For instance, Qasemi, a senior neurologist, stated that if telemedicine was used for the management of stroke patients in Afghanistan, it would be "as if the neurologist is next to the bed of a stroke patient" and for patient it would be "like he is hospitalized in a neurology ward in Kabul and receives the same level of care and attention as the other stroke patients receive in Kabul." Qasemi further added that the "use of telemedicine will revolutionize the medical field in Afghanistan, because through the use of telemedicine even a nurse in the remote areas will be as efficient as a medical professor [expert medical staff]." The participants' perceptions about the relative advantage of telemedicine were very high, and according to Cain and Mittman (2002), and Rogers (2003), if the level of relative advantage of an innovation is higher, then it is more likely that the innovation will be adopted rapidly.

Another important characteristic of the theory of DI is trialability of an innovation, which means experimenting with an innovation prior to a major investment or disposal of the existing practices. Trialability requires the experimentation of an innovation on a limited basis with minimal investment and commitment. It reduces the uncertainty of potential adopters pertaining to an innovation and increases the likelihood of its adoption (Cain & Mittman, 2002; Rogers, 2003). Some of the respondents had similar perceptions, that if telemedicine is applied in Afghanistan, at first it should be applied as a pilot project between a regional and a provincial or a regional and tertiary hospital in Kabul, and if the results are satisfactory then it should be extended to other hospitals in different medical specialities in various provinces. For instance, Hameed, an official from the MoPH, talked about the pilot project of m-health in Badakhshan, which is one of the remote provinces in Afghanistan. He added that the m-health pilot project was designed to connect community health volunteers with specialists and healthcare centers, and in case of medical emergencies in their communities; they use their mobile phones to contact the owners of vehicles within their local communities to assist patients' transportation to the health care centers. Hameed further mentioned that "this is a very small pilot project and we will evaluate its effectiveness, and if it is successful then we will implement similar projects in other provinces too."

Additionally, many respondents believed that application of telemedicine in Afghanistan would reduce stroke patients' need to travel and receive treatment from neurologists in Kabul. For instance, Yarmal indicated that many of the stroke patients in Afghanistan, especially those patients that live in the remote provinces, cannot afford to travel to Kabul to get specialized treatment. Therefore, "if telemedicine is utilized in Afghanistan, it will help them to be treated in their provinces and they will not need to travel to Kabul and can save their money too." Aghar, Schapira, and Maker

(2002) claim that "telemedicine reduces travel costs and saves patients time; therefore, the cost-effectiveness of telemedicine should be calculated based on patients travel expenses, lodging costs, and "lost productivity" (p. 290).

In addition, Wootton (2001) mentions that telemedicine has the potential to improve access to health care services, especially in the remote and medically underserved areas of developing countries, where access to health care facilities is limited due to geographical problems or/and a shortage of qualified medical personal. Similarly, some of the participants had similar perceptions and talked about some of the organizational barriers to the management of stroke patients in Afghanistan. They stated that the lack of specialized stroke treatment centers with advanced diagnostic imaging equipment and adequate numbers of trained medical staff are some of the major obstacles to the timely diagnosis and management of stroke patients in Afghanistan. For instance, Majeed, a senior general surgeon, thought that telemedicine might play a more significant role in the medical field in some of the developing and poor countries. He believed that in some of the developing and poor countries of the world, like Afghanistan, medical facilities and resources, including professional medical personal, are limited and cannot appropriately respond to the needs of their populations. Moreover, Hameed also believed that "unfortunately, we do not have well-equipped cardiac and neurology centers in Afghanistan." He further stated, "We do not have an adequate number of trained cardiologists and neurologists to respond to the needs of the high numbers of cardiac and neurology patients, including stroke patients, in Afghanistan." In addition, Wahab, a senior neurosurgeon, mentioned that the lack of CT scan and MRI machines in his hospital were causing delays in the timely diagnosis of their stroke patients.

Participants' Perceptions of Telemedicine in the Management of Stroke Patients

The first research question asked about the perceptions of the Afghan medical professionals regarding the potential use of telemedicine as a means of improving the delivery of health services to stroke patients in Afghanistan. In answering this question, respondents perceived that the application of telemedicine in the management of stroke patients would be potentially beneficial. Some of the participants indicated that telemedicine would be capable of bringing a lot of positive changes in the evaluation, diagnosis, and management of stroke patients, especially in the remote and isolated provinces where specialized health care services are scarce. For example, Qasemi believed that telemedicine would enable the health care providers in the remote provinces of Afghanistan to be more efficient in the diagnosis and management of stroke patients. According to Whitten, Cook, and Cornacchione (2011), telemedicine has the potential to improve access to specialized health care services by overcoming geographical and socio-economic barriers, particularly for medically underserved communities in rural and remote areas who encounter problems with shortages of specialized healthcare services.

Furthermore, some participants stated that telemedicine would pave the way for the timely evaluation, diagnosis, and treatment of stroke patients in remote areas, where there are no neurology specialists, and it would not be easy and cost-effective for the stroke patients to go to Kabul to seek specialized stroke treatment. Reza mentioned that due to economic and transportation problems, it would be very difficult for stroke patients to travel from the remote provinces of Afghanistan to Kabul for better diagnosis and treatment. Whitten, Cook, and Cornacchione (2011) indicate that improving access to quality healthcare services is one of the greatest advantages of telemedicine, as it is "enabling the provision of access to care where it is otherwise not likely to be available" (p. 87). In

addition, Ashley (2002) mentions that elimination of physical distances among providers and patients; improvement in the quality of healthcare services by facilitating medical training and education; and improving the skills and expertise of health practitioners across distances, which are some of the major advantages of telemedicine.

Additionally, several participants' perceptions of telemedicine were just limited to the use of videoconferencing for medical consultations and education among health care providers or health care facilities in Afghanistan or across borders. Some specialists in Kabul stated that they sometimes received phone calls from physicians in different provinces for a second opinion or medical consultations about some of their complicated patients who may require a specialist. These participants mentioned that they assisted and saved the lives of several patients by providing consultations to the provincial physicians. In other words, these specialists did not realize that they were engaged in telemedicine consultations by using their cell phones. To them exchanging medical information, through their cell phones, was not considered a telemedicine consultation, because they were under the impression that telemedicine consultations were just done through videoconferencing. For instance, Reza believed that telemedicine facilitated a connection and communication between two health care providers or health centers via videoconferencing. However, scholars believe that applications of telemedicine assist in transferring medical expertise and knowledge across distance, and facilitate clinical care and information exchange, "whether that information is voice, an image, elements of a medical record, or commands to a surgical robot" (Coiera, 1995, p. 1381; Medina-Garrido & Crisóstomo-Acevedo, 2009; Stanberry, 2001).

In addition, among the participants, only few of them talked about the perceived barriers to the successful implementation of telemedicine for the management of stroke patients in Afghanistan. For

example, Hameed stated that the lack of electricity in some of the remote areas of Afghanistan would impede the successful implementation of telemedicine projects in these areas. According to Eccles (2012), Martinez, Villarroel, Seqane, and Pozo, (2004), in the developing countries, the lack of electricity in rural areas, scarcity of ICT infrastructure, slow Internet connections, equipment breakdowns, limited finical ability to afford smooth functioning and maintenance of telemedicine networks, and a limited number of trained medical personal to utilize telemedicine, are among some of the key impeding factors that hinder and discourage the successful implementation of telemedicine in rural areas of developing countries (Puustjarvi, J. & Puustjarvi, 2011). Similar situations may also apply to Afghanistan.

Furthermore, some of the participants mentioned the problems that can be caused by the lack of the diagnostic imaging equipment for the diagnosis of stroke patients. They believed that without having imaging equipment such as CT scan or /and MRI machines in the remote provinces of Afghanistan, it would be impossible for neurologists to assist the stroke patients from Kabul. Reza stated that "telemedicine can be helpful in the management of stroke patients in Afghanistan if the required diagnostic equipment and laboratory tests for the diagnosis of stroke patients are also available in those provinces." Yarmal had similar concerns and claimed that:

> If we have CT scan and other diagnostic facilities in the provinces then telemedicine will be very effective in the management of stroke patients, because imaging diagnostic findings, and our clinical evaluations and assessments of stroke patients will help us to diagnose and treat the stroke patients in the remote areas of Afghanistan through telemedicine.

It is important to note that most of the participants did not have practical experience with telemedicine applications and some of them had just heard about it; as such, none of the respondents discussed the legal or ethical issues that may hamper the successful implementation of a telemedicine

project in Afghanistan. These legal and ethical concerns include, but are not limited to, privacy, confidentiality, and security of patients' information and medical records; inter-state or cross-border telemedicine consultations; and professional liabilities (Maheu, Whitten, & Allen, 2001; Stanberry, 2006; Whitten, Cook, & Cornacchione, 2011). Moreover, "medical personnel are required to be licensed by the state in which they practice" (Burke & Weill, 2005, p. 69). Therefore, physicians or other health practitioners who engage in inter-state telemedicine consultations must be licensed to practice medicine in each state where their patients are located (Glenn, 2012). However, to the best of the researcher's knowledge there is no literature to delineate the overall rules and legislations for physicians' licensing procedures in Afghanistan. Accordingly, the researcher of this study states that based on his thirteen years of experience as a practicing physician in Afghanistan, not only are licensed Afghan medical doctors able to practice medicine within the different provinces of Afghanistan, but so can overseas medical doctors with valid medical licences from their own countries. Therefore, medical licensures may not be a major legal barrier to the adoption and application of telemedicine in Afghanistan, because to the best of the researcher's knowledge, Afghan medical doctors are not required to have two medical licenses to engage in interprovincial telemedicine consultations.

Participants' Perception of Knowledge Sharing

Several respondents expressed their perceptions of knowledge sharing and its significance in the medical field. From the perspectives of these participants, knowledge sharing among health care providers is vital for enhancing the professional knowledge of health care providers and improving the quality of patient care. According to Staiger (2008), Wang and Noe (2010), knowledge sharing

and transfer are vital for sustainable organisational development because they provide competitive advantages to organizations by increasing their organizational learning, improving staff skills and promoting their involvement within organizations, and enhancing efficacy and transparency in organizations. Similarly, many participants believed that knowledge sharing was very important for the improvement of their skills as well as work outcomes. Some of them mentioned that in order to share their knowledge with their colleagues they hold medical conferences on different medical topics within their hospitals. Dwivedi, Bali, and Naguib (2007), and Ryu, Ho, and Han (2003) believe that knowledge sharing among various categories of healthcare providers is an essential, accepted, and common practice in the medical field all over the world, because knowledge sharing in the medical field is important to improving the quality and effectiveness of patient care in medical facilities.

Nevertheless, some of the participants talked about some of the obstacles to knowledge sharing among health care providers in Afghanistan, such as organizational, socio-cultural, security, and geographical problems as well as underutilization of ICT in the medical field in Afghanistan. For instance, Hameed mentioned that "we have not been able to use ICT in the medical field effectively, especially for knowledge sharing and training of our medical staff." Hendriks (1999), states that ICT plays an important role in the enhancement of knowledge sharing, because it can reduce "temporal and spatial barriers between knowledge workers" (p. 91). In addition, some of the participants discussed the existence of professional jealousy among some of the health care providers in their hospitals. They declared that some of the professionals were reluctant to share their skills and expertise with other health care providers, because they thought that knowledge sharing would reduce their importance in their hospitals. According to Lilleoere and Hansen (2011), one of the main obstacles to knowledge sharing within organizations is the perception of "knowledge equals power"

(p.56). Wallace (2007) also claims that “the truism that 'knowledge is power' dictates that the power of knowledge may be greatest when knowledge is withheld” (p.110).

Participant’s Perceptions of the Role of Telemedicine in Knowledge Sharing

Callas, Ricci, and Caputo (2000), and Curran, Murphy, Abidi, and McGrath (2009) believe that it is essential for health care professionals to update their medical knowledge about new advances and developments in the medical field. However, it may not be possible for all health care providers in Afghanistan, especially those who live in rural and remote areas, to stay abreast of medical advances and new medical information by attending medical workshops, conferences, lectures, and other educational events. Therefore, utilization of telemedicine may facilitate the delivery of CME programs to rural healthcare providers, reduce the need for travel, decrease feelings of professional isolation, and increase the ability of health professionals to remain current with new medical information and advances (Curran, 2006; Callas, Ricci, & Caputo, 2000).

In response to the second research question, what role would telemedicine play in knowledge sharing among health care providers in Afghanistan, many respondents expressed their willingness for using telemedicine as an effective means to share their professional knowledge and skills with other health care providers across distances. Almost all the participants talked about the potential contribution of knowledge sharing via telemedicine in Afghanistan’s health care system. For example, Qasemi mentioned that “telemedicine will possibly be effective in knowledge sharing, because the exchange of views and consultations between two health providers would pave the way for knowledge sharing and both physicians and specialists can learn from one another.” Like Qasemi, some other participants also elaborated on the significance of telemedicine for facilitating knowledge

sharing by creating a favorable and optimal environment for professional knowledge exchange among physicians, specialists, and other health care providers in different parts of Afghanistan. Therefore, some of the participants believed that the application of telemedicine in Afghanistan's medical field would not only improve the quality and outcomes of their work, but it would also pave the way for positive changes and capacity building within their hospitals.

According to Curran (2006), telemedicine plays an important role in knowledge sharing among health care providers across distances. Furthermore, Deng and Poole (2003) also state that telemedicine not only has the potential to improve accessibility to specialized healthcare service and reduce travel costs for patients and providers, but it also has the potential to facilitate knowledge sharing and transformation of medical practices among participants across distances. Similarly, Arif, an emergency medicine specialist, claimed that:

> If we share our professional information and skills via telemedicine with those health care providers that practice medicine in the remote and isolated areas of Afghanistan, then we will be able to overcome some of the main challenges, which threaten the health and well-being of our people in those areas.

The chapter examined the findings obtained from the respondents' interviews and addressed the two research questions of the study, which were posed in chapter two. The results were compared, analyzed, and discussed in relation to the reviewed literature for this study, and guided by the theories of actor-network and diffusion of innovations, which provided a theoretical framework for this investigation. This chapter revealed, many participants believed that the application of telemedicine would assist them in saving the lives of their stroke patients by diagnosing and treating them in time and preventing further complications. The chapter also discussed participants' perceptions of the role of telemedicine in knowledge sharing and revealed that almost all the participants were optimistic

about the potential contribution of telemedicine to knowledge sharing among health care providers in Afghanistan.

The following concluding chapter will summarize findings of the study; provide suggestions and recommendations, elaborate on the role of the researcher of the study; and discuss limitations of this study and opportunities for future research.

Chapter Six: Conclusion

This study has examined the role of telemedicine in the management of stroke patients and knowledge sharing among health care providers in Afghanistan. To this end, fourteen semi-structured in-depth interviews were employed with physicians, specialists, neurologists, and officials from the MoPH in Afghanistan. The main objective of the study has been to explore the potential effectiveness and perceived barriers regarding the application of telemedicine as a means, among other efforts, for better delivery of health care services to stroke patients, especially patients in remote and medically underserved areas of Afghanistan, where specialized health care services are limited. Following the data collection using face-to-face semi-structured interviews, a thematic analysis of the transcribed interviews was conducted and main themes were identified. Accordingly, based on the main themes, the data were categorized and coded, which started with open coding, followed by axial coding, and ended with selective coding. The findings of this study demonstrate that almost all the participants of the study were optimistic about the potential positive role telemedicine could play in the management of stroke patients and knowledge sharing among health care providers in Afghanistan.

Participants discussed some of the existing organisational, socio-economic, geographical, security, and cultural barriers to the management of stroke patients and knowledge sharing among health care providers in Afghanistan. They perceived that telemedicine would be an efficient communication means that would enable them to connect and communicate with other health care providers and patients in Afghanistan as well as with overseas health care providers. Many of the participants believed that the application of telemedicine would create a favorable and conducive environment for exchanging views and knowledge sharing among various levels of health care providers, which would eventually lead to capacity building and organizational strength. However, few participants were overoptimistic about the use of telemedicine and believed that the application of telemedicine would revolutionize the medical field in Afghanistan. Furthermore, some of the participants suggested that the MoPH should take firm and practical steps to incorporate telemedicine in the management of stroke and other acute medical emergencies. They urged that the MoPH should pay serious attention to reducing some of the organizational barriers to the management of stoke patients in Afghanistan. For instance, they stated that the MoPH should provide the required diagnostic imaging equipment to assist them in the timely diagnosis and treatment of stroke patients.

Recommendations

Based on the findings of the study and the exiting literature on telemedicine, the researcher of this study makes the following recommendations about the potential application of telemedicine in the management of stroke patients and knowledge sharing among health care providers in Afghanistan:

- It should be noted that when commencing a telemedicine project in Afghanistan, a small-scale pilot project should be initiated first, and then if positive results are achieved, and taking into

account the needs for improvement, the project should be expanded in other medical specialities too (Wootton, 2001; Wootton & Bonnardot, 2010);

- Adequate funding should be allocated prior to starting a telemedicine project, because unsustainable funding may jeopardize the development of a telemedicine project (Wootton, 2001; Wootton & Bonnardot, 2010);
- Prior to starting a telemedicine project in Afghanistan, the MoPH should develop a clear strategy and address all the ethical and legal issues that may negatively impact the successful implementation of telemedicine in Afghanistan (Broens et al., 2007; Buck, 2009);
- Expectations from the positive role of telemedicine should not be too high, especially at the early stages of a telemedicine project, because "telemedicine is unlikely to be a panacea" (Wootton 2001, p. 3) to address all the health care problems in Afghanistan;
- According to the researcher, the MoPH should learn from the failures and successes of other developing countries, especially from the neighbouring countries, in the adoption and implementation of telemedicine projects (Mittman & Cain, 2002);
- Telemedicine would not be effective in the management of stroke patients in Afghanistan unless the provincial and regional hospitals are equipped with the required diagnostic imaging equipment for stroke patients, such as CT scan and MRI machines (Reza; Yarmal);
- The MoPH should have well-equipped stroke treatment centers at least in Kabul and some of the major provinces (Hameed; Farid);
- Less advanced and cost-effective telemedicine equipment should be used at the early stages of a telemedicine project for the management of stroke patients in Afghanistan, because there is

no need to use sophisticated and expensive telemedicine equipment at the initial stages (Wootton & Bonnardot, 2010);

- Health care providers and non-medical staff who will engage in the telemedicine project should be rewarded and motivated by some kind of incentive (Hamayoon);
- The MoPH in collaboration with the MCTI and other stakeholders should embrace and implement a telemedicine project that is compatible with the past experiences and current practices of the potential adopters and is consistent with the current economic and socio-cultural situations in Afghanistan (Rogers, 2003; Pereira, Fife & Schuh. n.d.);
- The researcher recommends that the MoPH should work in close collaboration with the Ministry of Communications and Information Technology (MCIT), international donors, NGOs, health care providers, and other involved stakeholders;
- The MoPH should enhance public awareness about stroke warning symptoms, its major complications, and the importance of patients' early arrival to the medical centers. In addition, the MoPH should disseminate culturally appropriate messages to address some of the socio-cultural barriers that impede the early arrival of stroke patients to the health care facilities in Afghanistan (Qasemi; Arif);
- The MoPH should foster the culture of knowledge sharing among health care providers by all possible means, including using telemedicine as an effective communication means to reach the health care providers in the remote and isolated areas of Afghanistan (Mansoori; Qasemi; Hamayoon; Yarmal);

- The MoPH should support, appreciate, and motivate those health care providers who are willing to share their knowledge with other health care providers (Casimir, Keith Ng, & Cheng, 2011; Lilleoere & Hansen, 2011); and
- According to the researcher, the MoPH and other medical professional associations, such as the Afghan physicians association, Afghan surgeons association, and so on, should enhance the Afghan health care providers,' particularly specialists,' awareness about the values that knowledge sharing can add to their organizations, communities, and society as a whole.

Limitations and Opportunities for Future Research

Although this research study has obtained some academic insights about the potential role of telemedicine in the management of stroke patients and knowledge sharing among health care providers in Afghanistan, it is not without limitations, which should be taken into account while interpreting the study findings and conducting future research. First, the small sample size of fourteen physicians, specialists, neurologists, and policy makers, who were recruited for this study, do not represent the larger group of the Afghan health care providers. Second, all the participants were recruited in Kabul, the capital of Afghanistan. The researcher initially proposed to travel to some remote provinces of Afghanistan and conduct interviews with several health care providers in those provinces. However, due to security concerns in Afghanistan, the REB granted permission to the researcher to only conduct interviews in Kabul. Thus, if the security situation improves, future research can recruit more participants from various provinces of Afghanistan. Luckily, the researcher was able to interview a practicing physician from Mazar-e Sharif regional hospital, who came to Kabul on a personal trip, and a neurologist who worked during the weakened in his native district,

Jabal Saraj district, Parwan province,[33] to assist the neurology patients of Jabal Saraj and the neighbouring districts and provinces in his private clinic. In addition, while recruiting the participants, the researcher adopted some inclusion criteria, such as recruiting those physicians, specialists, and neurologists who have had experience in practicing medicine not only in Kabul city, but also in various provinces of Afghanistan. Such inclusion criteria enabled the researcher to have a better understanding of the real situation of healthcare practices in Afghanistan (Keyton, 2011). Third, the study had only focused on the health care providers' perceptions about the current problems and challenges of the stroke patients in Afghanistan and explored the potential role of telemedicine in the management of these patients. If time allowed, the researcher would have interviewed some stroke survivors or their relatives too. Thus, future research can explore the perceptions of stroke survivors and their family members about their experiences with strokes and the services they receive.

In addition, both theories of diffusion of innovations and actor network were employed as theoretical frameworks to guide this study. However, only some concepts of these theories informed the study due to the lack of an existing telemedicine program in Afghanistan. For instance, application of the theory of diffusion of innovations as a theoretical framework for this study assisted to determine enablers and obstacles to the successful adoption and implementation of telemedicine in Afghanistan. In addition, among the five characteristics of innovations that elucidate the rate of adoption, relative advantage and compatibility assisted the study more than trailability and observibility, because there was no functioning telemedicine program in Afghanistan; therefore, it was not possible to focus on the trailability and observability of the DI. Nevertheless, after the

[33] Jabal Saraj district is one of the districts of Parwan province and located in the north of the capital Kabul,

adoption and implementation of telemedicine in Afghanistan, future research, particularly research that focuses on the perceptions of the rural health care practitioners in Afghanistan, may possibly employ most concepts of the theory of diffusion of innovations to determine adopters and non-adopters as well as explore the ways the diffusion of telemedicine can be improved among non-adopters.

Similarly, the actor-network theory, particularly the concept of translation, provided a useful lens to ascertain whether or not, through this network of telemedicine, physicians, neurologists, and policy makers from the MoPH and MCIT would likely cooperate with each other to form telemedicine network and utilize telemedicine as a means among other efforts for better management of stroke patients and knowledge sharing among health care providers in Afghanistan. However, due to time constraints, it was not possible to interview some officials from the MCIT and international donor agencies in Afghanistan. If time allowed, the researcher would have interviewed these actors. Therefore, future research on telemedicine in Afghanistan may recruit participants from MCIT and international donor agencies as well. Thus, once telemedicine is implemented and practiced in Afghanistan, then future research can be better informed by the actor-network theory to study the heterogeneous association among the involved actors in a telemedicine network.

Notwithstanding, despite these limitations, this study, which has explored the potential role of telemedicine application in the management of stroke patients and knowledge sharing among health care providers in Afghanistan, will likely pave the way for future research on similar topics. Furthermore, this study does not claim that telemedicine will be a panacea to solve all the health care problems in Afghanistan. However, telemedicine may be a potential means, among other efforts, for

better evaluation, diagnosis, and treatment of stroke patients, especially in the remote and medically underserved areas. Moreover, to the best of the researcher's knowledge, there has been no study of this kind in Afghanistan yet; thus, the findings of this study will possibly contribute to the development of health communication in the context of Afghanistan. More specifically, the findings of this study could likely be used as resources for future research on the applications of telemedicine in various medical specialities, or/and incorporation of ICT into the medical field in Afghanistan.

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Appendix A: Ethics Approval

Université d'Ottawa University of Ottawa

Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

Ethics Approval Notice

Social Science and Humanities REB

Principal Investigator / Supervisor / Co-investigator(s) / Student(s)

First Name	Last Name	Affiliation	Role
Rukhsana	Ahmed	Arts / Communication	Supervisor
Wahidullah	Mayar	Arts / Communication	Student Researcher

File Number: 06-12-09

Type of Project: Master's Thesis

Title: The Role of Telemedicine in the Management of Stroke Patients and Knowledge Sharing Among Health Care Providers in Afghanistan

Approval Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
08/01/2012	07/31/2013	Ia

(Ia: Approval, Ib: Approval for initial stage only)

Special Conditions / Comments:

Université d'Ottawa University of Ottawa

Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

This is to confirm that the University of Ottawa Research Ethics Board identified above, which operates in accordance with the Tri-Council Policy Statement and other applicable laws and regulations in Ontario, has examined and approved the application for ethical approval for the above named research project as of the Ethics Approval Date indicated for the period above and subject to the conditions listed the section above entitled "Special Conditions / Comments".

During the course of the study the protocol may not be modified without prior written approval from the REB except when necessary to remove subjects from immediate endangerment or when the modification(s) pertain to only administrative or logistical components of the study (e.g. change of telephone number). Investigators must also promptly alert the REB of any changes which increase the risk to participant(s), any changes which considerably affect the conduct of the project, all unanticipated and harmful events that occur, and new information that may negatively affect the conduct of the project and safety of the participant(s). Modifications to the project, information/consent documentation, and/or recruitment documentation, should be submitted to this office for approval using the "Modification to research project" form available at: http://www.research.uottawa.ca/ethics/forms.html.

Please submit an annual status report to the Protocol Officer four weeks before the above-referenced expiry date to either close the file or request a renewal of ethics approval. This document can be found at: http://www.research.uottawa.ca/ethics/forms.html.

Appendix B: Informed Consent

Title of the study: The Role of Telemedicine in the Management of Stroke Patients and Knowledge Sharing among Health Care providers in Afghanistan. Wahidullah Mayar will be conducting his research as part of his master's thesis in the department of communication at the University of Ottawa under the supervision of Dr. Rukhsana Ahmed of the Department of Communication, University of Ottawa.

Invitation to Participate: I am invited to participate in the abovementioned research study conducted by Wahidullah Mayar.

Purpose of the Study: The purpose of the study is to explore the potential use of telemedicine among other efforts for better evaluation, diagnosis, and treatment of stroke patients as well as knowledge sharing among health care providers in Afghanistan.

Participation: My participation in this study is voluntary and will consist essentially of personal interview which will last between thirty minutes to an hour. During the interview I will be answering to the questions of the researcher if I want to. Interview will be conducted in a mutually convenient time and location.

Risks: My participation in this study will entail no more than minimal risk of harms to me. I have received assurance from the researcher (Wahidullah Mayar) that every effort will be made to minimize these risks. The researcher has assured me that there is no perceived or evident risk

of harms to me as a participant in this study. In addition, the information I provide will be strictly confidential and my identity will be anonymous unless I give permission that my name will be used in the research.

Benefits: My participation in this study will not have direct benefits to me. However, it helps the researcher to gather and analyze reliable and relevant data regarding the potential use of telemedicine in Afghanistan which is likely to contribute to the development of knowledge. On the practical ground, this research anticipates that the findings of this study will convince Afghan policy makers and some potential donors to accept and consider telemedicine as an efficient way of delivering quality health care services to remote and isolated areas, and utilize telemedicine as an effective communication tool for educating and training Afghan health care providers through knowledge exchange and sharing. This research is first of its kind and has not been conducted by any other communication researcher in an Afghan context yet.

Confidentiality and anonymity: I have received assurance from the researcher that the information I will share will remain strictly confidential. I understand that the contents will be used only to explore the potential use of telemedicine among other efforts for better evaluation, diagnosis, and treatment of stroke patients as well as knowledge sharing among health care providers in Afghanistan. My confidentiality will be protected, the information I provide will be strictly confidential, and my identity will be anonymous unless I give permission that my name will be used in the research.

Conservation of data: The data collected (tape recordings of interviews and their transcripts) both soft and hard copies, will be stored in the office of the thesis supervisor, Dr. Rukhsana Ahmed at the university of Ottawa. The researcher and the thesis supervisor will have access to the data. After the completion of the project, data will be conserved for five years.

Voluntary Participation: I am under no obligation to participate and if I choose to participate, I can withdraw from the study at any time and/or refuse to answer any questions, without suffering any negative consequences. If I choose to withdraw, I will be provided the opportunity to remove my data from the study, and all the data gathered from me will be destroyed.

Acceptance: I, (_____), agree to participate in the above research study conducted by Wahidullah Mayar of the Department of Communication, Faculty of Arts, University of Ottawa, which research is under the supervision of Dr. Rukhsana Ahmed.

I wish to receive a summary of findings of this research when available: Yes ___ No ___

I would like to remain anonymous in the research: Yes _____ NO _____

Interview can be: Audio recorded_____ None_____

There are two copies of the consent form, one of which is mine to keep.

Participant's signature: (Signature) Date: (_____)

Researcher's signature: (Signature) Date: (_____)

Appendix C: Interview Protocol and Questions

Interview Protocol

The interview guideline (protocol) for this study is based on semi-structured interviews with physicians, specialists, neurologists, and policy makers of the Afghan Ministry of Public Health. The interviews will be face-to-face and open-ended questions will be asked. The interviews will be conducted in locations and times that are comfortable and convenient for the respondents, and each interview will last between thirty minutes to one hour. The researcher will start the interview with general and introductory questions, which will be followed by specific and follow up questions, eventually the interview will be ended by asking concluding and wrap-up questions. In addition, the researcher will use descriptive and probing questions; for example, how would you describe…? Could you please elaborate on this idea? Can you please describe this further? Or would you please provide me an example (Keyton, 2006; Boyce & Neale, 2006)?

At the beginning of the interview, the researcher will introduce himself and explain the significance of his research project. Then he will ask the participant to voluntarily sign the consent form. Afterwards, the researcher will ask some general and introductory questions to build rapport with the interviewee and make him or her feel comfortable. Once the respondent gets familiar with the research topic and feels comfortable, then specific and follow up questions will be asked. All the interview questions are aimed at answering the main research questions. At

the end of the interview, closing questions will be asked from the participant; for example, respondent will be asked if there is anything more that he or she would like to add. Or if he or she has any further questions or comments about the research. The interview will conclude by thanking the participant for his or her participation in the research study (Silverman, 2006; Kvale, 1996; Kennedy, 2006).

Interview Question for Physicians and Specialists

1. Can you tell me about yourself and what role do you play in this center (or hospital)?
2. Can you please explain how you manage your patients with stroke?
3. What are some of the major challenges and problems that you face in managing them?
4. Where do you transfer your stroke patents and how long does it take to transfer them there?
5. What services do these referral center(s) provide?
6. How do you interact and communicate with these referral center(s)?
7. How easy is it to refer your patients to these referral center(s)?
8. How satisfied are you with the treatment and care that your stroke patients receive at these referral center(s)?
9. Do you know about telemedicine?
10. Do you think that the use of telemedicine would help you to better manage your stroke patients prior to transferring them to these referral center(s)?
    A. If yes, please explain why and how?

B. If not, please describe why do you think so?

C. Could you please tell me that how you share and exchange knowledge with other healthcare providers?

D. Can you tell me that how often you participate in Continuing Medical Education (CME)?

E. Do you think that use of telemedicine would create a favorable environment for exchange of views and knowledge sharing?

   A. If yes, how helpful do you think it would be?

   B. What specific contribution will it make in the enhancement of your knowledge and expertise?

Thank you very much for your time. If you have any further questions, I would be pleased to answer**.**

Interview Questions for Neurologists

1- Can you tell me about your center and the number of stroke patients that are treated here?

2- Could you please describe your role in this treatment center?

3- How do you admit your stroke patients in this center?

   A. Can you tell me how and from where patients are transferred to your center?

   B. How long does it take for patients to arrive from remote areas to your center?

   C. What do you do with these patients?

4- Do you have all the necessary equipment and medications to diagnose and treat your stroke patients?

5- How would you describe the role of thrombolytic (blood thinners) therapy in your ischemic stroke patients?

6- Have you noticed any changes in the management of your ischemic stroke patients in recent years?

7- Generally speaking, how would you describe the level of satisfaction of your stroke patients with your services?

8- Do you collaborate with other hospitals in the management of stroke patients?

9- In your experience, what are some of the main challenges that you face during the treatment of stroke patients?

10- Do you know about telemedicine?

11- In your opinion, would the use of telemedicine help to start early treatment for stroke patients in areas where there is no neurologist or stroke center?

12- Does your center provide any training to physicians and other specialists to identify the early symptoms of stroke patients and enable them to better manage their stroke patients?

    A. If yes, how often and where?

    B. Does this training include physicians in the remote and isolated areas as well?

    C. If not, what are the reason(s)?

13- Do you think that the use of telemedicine will enhance the delivery of health services in remote areas?

A. If yes, how could telemedicine will enhance it?

B. If not, why it cannot enhance it?

14- Do you think that by using telemedicine your center will be able to train physicians in the remote areas on better evaluation and management of stroke patients?

15- Would you like to offer your assistance to stroke patients in remote areas through telemedicine?

16- In your opinion, how useful would telemedicine be in dissemination of information and knowledge sharing among health care providers in Afghanistan?

Do you have any questions or comments? Thank you very much for participating.

Interview Questions for the Policy Makers and Officials from the Afghan Ministry of Public Health

1- Could you please tell me about your role at the ministry?

2- How do you evaluate the current health services to the management of stroke patients in Afghanistan?

3- Can you tell me that how does the Afghan Ministry of Public Health train its health care providers in major cities and in remote areas?

A. In your opinion, are these training programs successful, especially in distant areas?

B. If not, what can be done to enhance the effectiveness of these trainings and knowledge sharing among health care providers?

4- Do you think that the use of telemedicine will pave the way for a favorable and conducive environment for knowledge sharing and exchange of information among specialists in the capital and other health care providers in remote areas?
5- What role should the Afghan Ministry of Public Health play in the establishment and development of sustainable telemedicine in Afghanistan?
6- What can be done to motivate health care providers to be willing to use telemedicine?

Would you like to add anything more? Do you have any comments or concerns? Thank you so much for time.

Appendix D: Main Themes and Subthemes

Perceived Barriers to Stroke Management in Afghanistan	Perceived Barriers to Knowledge Sharing in Afghanistan	Participant's Perception of Telemedicine
Organisational barriers	Organisational barriers	Participants' perceptions of the role of telemedicine in the management of stroke patients
Geographical barriers	Geographical barriers	Participants' perceptions of the role of telemedicine in knowledge sharing
Socio-cultural barriers	Socio-cultural barriers	