BARRIERS TO PHYSICIAN ADOPTION OF TELEMEDICINE AND BEST PRACTICES FOR OVERCOMING THESE BARRIERS

BY

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A doctoral project submitted to the faculty of the Medical University of South Carolina in partial fulfillment of the requirements for the degree Doctor of Health Administration in the College of Health Professions

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# Table of Contents

Acknowledgements ............................................................................................................ iii  
List of Tables ................................................................................................................... viii  
List of figures ..................................................................................................................... ix  
Abstract ........................................................................................................................... x  

**CHAPTER I: INTRODUCTION** ...................................................................................... 1  
  
*Problem Statement* ....................................................................................................... 5  
*Research Questions* ....................................................................................................... 7  
*Assumptions* ................................................................................................................... 8  
*Operational Definitions* ............................................................................................... 9  
*Significance* ................................................................................................................... 11  

**CHAPTER II: REVIEW OF THE LITERATURE** .......................................................... 12  
  
*Method* .......................................................................................................................... 12  
*Definition of Telemedicine* .......................................................................................... 13  
*History of Telemedicine* .............................................................................................. 14  
*Uses of Telemedicine* ................................................................................................... 15  
*Benefits and Drawbacks* ............................................................................................... 16  
*Historical Barriers to Adoption of Telemedicine* ......................................................... 18  
*Poor Technology* .......................................................................................................... 18  
*Reimbursement* ............................................................................................................. 19  
*Privacy and Confidentiality* ......................................................................................... 20  
*Legal and Regulatory Issues* ....................................................................................... 21  
*Dissatisfaction* ............................................................................................................. 21
LIST OF TABLES

Table 1. Distribution of program manager key informants by occupation .................. 44

Table 2. Distribution of key informants by urban, rural, large medical center, and rural hospital. ............................................. 46

Table 3. Comparison of identified barriers to the adoption of telemedicine between the review of the literature and research study ......................... 89
LIST OF FIGURES

Figure 1. Geographic distribution of key informants .........................45
Abstract of Doctoral Project Report Presented to the
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ABSTRACT
The aging of the population and projected shortage of physicians in coming years will create significant access to health care problems for rural America. Telemedicine is seen as one method of maintaining access to urban specialist physicians for rural communities during this shortage. This qualitative study identified barriers to physician adoption of telemedicine and best practices for overcoming these barriers. Interviews were conducted with 32 physicians and program managers associated with successful telemedicine programs throughout the United States. Grounded theory methodology was used to identify: barriers to physician adoption of telemedicine, best practices for overcoming these barriers, and words of wisdom for new and developing telemedicine programs. The most significant contribution of this study was the emergence of new insight into physician perceived barriers to the adoption of telemedicine and best practices for overcoming these barriers.
A perfect storm is building in rural America. Just like the collision of the two air masses creates a storm, rural health care is facing a similar collision of two conditions that will create a tumultuous environment for rural hospitals and physicians. This storm in rural America is the result of the clash between the growing need for health care services and a declining availability of physicians to provide healthcare (Whitcomb, 2005; Rabinowitz, Diamond, Markham, & Rabinowitz, 2005).

The growing need for health care services in rural communities is driven by the aging of the population, an increase in life expectancy, and the increased incidence of chronic disease amongst older populations. Rural communities are experiencing the same increase in the average age of the population that is occurring on a national basis as a result of the aging of the largest segment of the population, commonly referred to as baby boomers, the segment of the population ages 40 to 60 representing more than a quarter of the U.S. population (Society for Healthcare Strategy, 2007). This growing population is further exaggerated in rural communities because a larger number of elderly people live there. Eighteen percent of the rural population is over 65 years of age compared to 15% of the total U.S. population (U.S. Census Bureau, 2000).

The growing elderly population is also expanding as a result of increasing life expectancy. The median age of the U.S. population increased from 34.1 to 34.9 in the last five years and life expectancy has increased from 73.7 in 1980 to 77.8 in 2004 (U.S. Census Bureau, 2000; The Advisory Board, 2007). With an older population comes an increased incidence of chronic diseases such as heart disease, cancer, stroke, and diabetes.
The Centers for Disease Control (2006) report death rates per 100,000 population for chronic diseases such as heart disease (222.7), cancer (187.4), and stroke (51.1); far exceeding death rates from acute conditions such as accidents (37.0), pneumonia (20.9), and suicide (10.8). With the increased incidence of chronic disease is an enlarged demand for health care services (The Advisory Board, 2007). Unfortunately, this growing need for health care services will coincide with an expected shortage of physicians.

Cooper and Getzen (2002) project a 50,000 physician shortage by the year 2010 and a 200,000 shortage by the year 2020 as a result of the increasing demand for health care services by an aging population and the growing number of physicians who are expected to retire and leave medical practice over the next few years. This projected national shortage of physicians will likely have a severe impact on rural America where proportionally fewer physicians practice. While 20% of the U.S. population reside in rural communities, fewer than 11% of the nation’s physicians practice there (Ricketts, 2000; Barley, Reeves, O'Brien-Gonzales, & Westfall, 2001). Compounding the problem is the fact that the average age of rural physicians is higher than the national average for physicians and rural physicians tend to retire at an earlier age (Merritt, Hawkins, & Miller, 2006).

Rural communities are heavily dependent upon primary care physicians trained in family practice, internal medicine, obstetrics and gynecology, and pediatrics to deliver health care. Specialist physicians rarely exist in rural communities because populations are not large enough to support a full-time practice (Merritt, Hawkins, & Miller, 2004/2006). The decrease in the number of physicians entering primary care (American
Academy of Family Physicians, 2007), combined with the fact that fewer than 4% of recent medical school graduates plan to practice in rural communities (Association of American Medical Colleges, 2006), heightens the concern for the future of access to health care in rural America. There simply will not be enough primary care physicians to meet the demand of rural communities (Council on Graduate, 1998).

Finally, the decision of medical students to choose a rural primary care practice is influenced by the amount of debt they incur during medical training. Approximately 80% of medical students incur significant debt ($80-100,000) to complete their education, and 25% also have service obligations to repay scholarships or loans (Pathman, Konrad, & King, 2000). Rabinowitz, Diamond, Hojat, & Hazelwood (1999) suggest that a higher debt load upon graduation further reduces the likelihood of a physician entering a relatively less well-paid practice in a rural area.

The growing demand for health care services and the anticipated shortage of physicians in rural America is creating the conditions necessary for the perfect storm. The consequence of which has the potential to limit local access to health care services in rural communities, require patients to travel great distances to access care, and even put patients in a situation where they will simply do without adequate care. The need to travel to urban centers to access health care represents a significant barrier to elderly citizens who live in rural communities. Many elderly patients can no longer safely drive and because public transportation does not usually exist in rural communities, they will be forced to impose upon a younger neighbor or family member to drive them to an urban physician appointment. The younger driver may have to take time off from work and spend a significant part of his or her day driving in order to help elderly patients access
care. The time, effort, and expense associated with having to travel to an urban center for a physician appointment increases the likelihood that elderly rural patients will simply do without healthcare (Bynum, Cranford, & Denny, 2003).

Avoiding the potential damage of this crisis will take creativity, ingenuity, technology, and hard work on the part of this nation’s rural health care providers. In the absence of local rural primary care physicians and urban specialist physicians, new ways have to be developed to bring physician services to rural patients in order to maintain local access to care. One way to help solve this dilemma is to bring primary and specialist physicians to rural communities to see patients. However, convincing already-busy urban physicians to travel to rural communities to see patients is almost impossible to accomplish. The next best alternative is to bring patients and physicians together electronically over long distances through use of telemedicine and video conferencing technology. Consequently, it will provide access to physicians for rural patients without having to incur lost time and money associated with travel on the part of either patients or physicians.

Video conferencing involves the use of video cameras and television monitors located at both urban and rural sites. Frequently this equipment is located in an urban physician's office and transmitted to and from equipment located in a rural hospital over dedicated telephone lines or the Internet. Both physician and patient are placed in front of a video camera such that their image and voice can be reproduced at the other end of the encounter. This form of electronic patient-physician communication is referred to as telemedicine, and it has the potential to provide rural patients’ access to urban physicians without having to incur the time and expense necessary to travel. Bynum (2003) found
that without the availability of telemedicine in rural communities, 94% of patients would have to travel more than 70 miles for medical care and 84% would have to miss at least one day of work to make a physician appointment. Thus, telemedicine is seen as a possible solution to this problem and it is anticipated that the demand for telemedicine will continue to grow in response to the aging of the population and the decline in the number of available physicians (Jennett et al., 2005).

Telemedicine has been available on a limited basis for almost 30 years, yet its adoption into the clinical practice of medicine has been slow. In the early years of television the quality of the video and audio was poor and the cost of the equipment was high. This was the first barrier to its adoption for telemedicine use. In more recent years other barriers such as limited access to high-speed transmission lines and unreliable equipment hampered physician adoption. Health care providers must also learn how to adapt this technology to facilitate patient-physician interaction. Consequently, the purpose of this study is to facilitate the adoption of telemedicine as a means of providing access to health care for rural patients by identifying the barriers to physician adoption of the technology and sharing best practice ideas for successfully overcoming these barriers.

**Problem Statement**

The increasing demand for health care services and the expected shortage of physicians will escalate access concerns for people living in rural America (Merritt, Hawkins, & Miller, 2004/2006). Telemedicine technology is one option to improve access to health care services, maximize the productivity of physicians, and avoid unnecessary travel time and expense for patients and physicians. In spite of 30 years of
progress in telemedicine, rural and urban physician resistance to the adoption of
telemecine into the clinical practice of medicine continues to be strong. Even in
amongst the most successful telemedicine programs, managers and physician leaders are
frustrated by this resistance to adopt and use telemedicine (Stanberry, 2000).

Physician resistance to the adoption of telemedicine is creating a polarizing effect
among health care professionals. Wootton (1997) described health care professionals as
being in one of two groups, those who enthusiastically adopt telemedicine into their
clinical practice and those who are vehemently against it. Proponents of telemedicine
believe that it represents the future and will lead to higher standards of care, better access,
and reduced cost (Bauer & Ringel, 1999). Opponents believe that it represents a threat to
the traditional face-to-face doctor-patient relationship and is intrinsically unsafe because
of the physician’s inability to touch the patient (Bulik, 2004). Introduction of
telemecine services into the practice of medicine in small rural communities has been
met with resistance by urban specialists and rural physicians alike (Stanberry, 2000).
Physician resistance can lengthen the time between introduction and successful
implementation of telemedicine exactly when rural America needs it the most (Stumpf,
Zalunardo, & Chen, 2002; Stanberry, 2000).

The demand for local access to health care in rural communities will continue to
grow as people live longer and they develop more chronic diseases. The number of rural
primary care physicians is expected to decline concurrently when rural populations will
need more health care services delivered in the their community. While access to rural
primary physicians is not yet recognized as a problem in rural communities, access to
urban specialist physicians is acknowledged as a major problem for most of the rural
population. Telemedicine is seen as one means to help solve this brewing problem and bring rural patients and urban physicians together electronically, yet physician adoption of telemedicine is slow and physician resistance to adopting telemedicine into the clinical practice of medicine still remains. We have a great deal to learn from the early pioneers in telemedicine and the successful programs throughout the country. These successful programs have found ways to overcome the barriers to physician adoption of telemedicine. To date there has been no comprehensive study to examine how these successful programs identified and overcame the remaining barriers to physician adoption. This study is designed to identify successful telemedicine programs throughout the country, identify the current barriers to physician adoption of telemedicine, and illuminate some of the best practices for overcoming these barriers.

**Research Questions**

Although much has been written about the barriers to adoption of telemedicine, progress toward more widespread use of the technology is only slowly evolving. The impending crisis in access to health care in rural America places great emphasis on identifying the remaining barriers to physician adoption of telemedicine and sharing of best practices for overcoming these barriers as a means of expediting the rate of telemedicine adoption. This study will add to the body of knowledge by identifying successful telemedicine programs, conducting interviews with program managers and physicians in these programs to identify the most common remaining physician barriers to the adoption of telemedicine, and describing best practices for overcoming these barriers. The greatest majority of successful telemedicine programs are currently
focusing their services on providing access to urban specialist physicians for rural populations. The number of programs providing rural primary care with telemedicine is extremely limited. For this reason, this study will focus on the problem of rural access to urban specialist physicians. Successful telemedicine programs are defined as programs which are used to facilitate video conferencing of physician-patient encounters with at least one patient on a weekly basis for more than one year.

The key research questions are the following:

1. What do successful telemedicine program managers and physicians perceive are the remaining barriers to adopting telemedicine into a medical practice?

2. What are their best practices for overcoming physician resistance to the adoption of telemedicine?

3. What insight or words of wisdom do these successful telemedicine program managers and physicians have to offer other health care professionals who are considering adopting telemedicine into their practices?

Assumptions

The key assumptions of this study are that successful telemedicine programs exist throughout the United States, that the program managers and physicians engaged in these programs have an interest in the topic of this study, and that these individuals would be willing to serve as key informants for the study. Furthermore, that these key informants have information about specific physician barriers to the adoption of telemedicine in their own programs, have examples of best practice for overcoming these barriers, and would be willing to share this experience openly, honestly, and candidly.
Operational Definitions

**Bandwidth:** The measure of a communication channel’s range of frequencies that a signal occupies. Higher bandwidth carries information faster than lower bandwidth.

**Broadband:** Telecommunication over a single medium that provides multiple channels of data for high-speed transmission. Broadband refers to a higher bandwidth that will support real-time, full-motion audio and video conferencing information.

**Confidentiality:** In the computer world, it means limiting the disclosure of private information by using authorization protocols to protect the information against theft or improper use.

**Encryption:** A system of encoding data where by the information can be transmitted, retrieved, and decoded only by the intended recipient, who holds the key to interpreting the message.

**Firewall:** Computer hardware and software designed to prevent unauthorized access between computer networks.

**Internet:** A collection of interconnected networks that speak the same computer language. The Internet now links millions of independent networks in a global communication system.

**Network:** Interconnected communication equipment used for data and information exchange.

**Primary care physician:** A physician who has completed medical training in general medicine, family practice, general internal medicine, obstetrics, or pediatrics.

**Real time:** Live-action process as opposed to processes that were recorded and transmitted at a later time.
Resolution: The level of detail that can be captured or displayed. The higher the resolution the higher the level of detail and perceived quality of the image displayed.

Rural: Sparsely populated geographic areas away from the influence of large cities.

Specialist physician: A physician who has completed a specialized level of training in a more defined medical discipline beyond that of primary or general medical care.

Store-and-forward: An asynchronous connection that permits audio, video, still images or data to be held now and transmitted or received at a later time.

Successful telemedicine program: A telemedicine program that has used video conferencing for direct physician-patient encounters at an average frequency of greater than one encounter per week for more than one year.

Telecommunication: Transmitting or receiving information with the use of wire, radio, satellite, fiber-optic, or other electromagnetic or optical media for voice, data, and video communications.

Telemedicine: The use of modern information technology, especially two-way interactive audio/video communications, computers, and telemetry to deliver health services between physicians and patients at a distance.

Telemetry: Automatic collection and transmission of data via wired or wireless media from stations based in remote locations (rural hospitals) to central receiving stations (urban hospitals) for recording and analysis.

Teleradiology: A system that transmits radiographic or X-ray images between divergent locations.

Urban: A geographical area including heavily populated cities and towns.
Videoconferencing: Two-way transmission of video images among multiple locations in real time to bring people from physically remote locations together for meetings and communications.

Significance

Future access to health care in rural communities will be somewhat dependent upon the ability of rural hospitals, physicians, and health care systems to successfully integrate the use of telemedicine into the clinical practice of medicine for physician-patient encounters. Telemedicine providers will need insight into the physician barriers to adoption of telemedicine and examples of best practice for overcoming these barriers to help them be successful. The perceptions offered by the successful telemedicine program managers and physicians included in the study may contribute to this insight, can be transferable to other programs, and may facilitate the adoption of telemedicine. The results of this study may also be important to governmental and private granting agencies in focusing their efforts to fund mechanisms to integrate telemedicine in rural communities. The insight gained as a result of this study will contribute to the body of knowledge about telemedicine and its successful adoption into the clinical practice of medicine.
CHAPTER II: REVIEW OF THE LITERATURE

This literature review was conducted to compile and synthesize published information and studies related to telemedicine: its history of development, the way it is used for physician-patient encounters, and the benefits and drawbacks of its use. The review then focuses specifically on the historical and currently identified barriers to physician adoption of telemedicine and some of the suggestions for overcoming these barriers. The primary objective of this review is to understand what barriers to adoption of telemedicine have been identified and to determine what questions need to be asked to establish a context for revealing new perceived barriers and best practices.

Method

The published literature reviewed for this study included books on telemedicine, a broad range of national and international journals, as well as news media, and issue briefs from professional associations, private, and governmental agencies. The literature was reviewed for descriptive and critical analyses of the barriers to adoption of telemedicine, issues related to adoption or use, and general success factors associated with overcoming physician resistance to the use of telemedicine.

The literature review began with searches of the major databases including PubMed, OVID MEDLINE, MEDLINE In-Process and other non-indexed citations, Cumulative Index to Nursing and Allied Health Literature, LexisNexis Academic, and Good Citations. Key words used in the search included telemedicine, telehealth, barriers, success factors, and best practice. OVID returned 1,406 articles for the key
words telemedicine and telehealth, 35 articles in combination with the word barriers, and 5 articles combined with the words success factors. PubMed returned 8,730 citations for the key words telemedicine and telehealth, 140 articles in combination with the word barriers, and 37 articles combined with the words success factors. LexisNexis returned 125 citations for the key words telemedicine and telehealth in the past year, 116 articles combined with the word barriers, and no citations when combined with the words success factors. Searches were completed in December of 2006 and January 2007 and Good Citations was used to continuously monitor new journal submissions with the key words telemedicine or telehealth. Abstracts of the citations were reviewed, electronic full-text articles downloaded, and articles not available electronically were requested and obtained from the Medical University of South Carolina Library.

Definition of Telemedicine

The first step in understanding what telemedicine is and how it is used is to define it. Coiera (1997) defines telemedicine as the electronic communication of information to facilitate clinical care. This communication can be further defined as the electronic exchange of information at a distance, whether that information is voice, image, medical records, or commands sent to a remote robot. The American Telemedicine Association (ATA) defines telemedicine as “the use of medical information exchanged from one site to another via electronic communications to improve patients' health status” (Telemedicine Defined, 2007, p. 1). Closely associated with telemedicine is the term telehealth, often used to encompass a broader definition of remote health care that does not always involve clinical services. Telehealth can include the use of technology to
remotely access health information, diagnostic images, and education. Frequently the terms telemedicine and telehealth are used interchangeably. For the purpose of this study the term **telemedicine** refers to use of electronic communications for the purpose of diagnosing and treating patients at a distance.

**History of Telemedicine**

In its simplest form, telemedicine is the use of any form of technology to facilitate communication relative to the delivery of healthcare. Some credit the first telemedicine communication with the Alexander Graham Bell's invention of the telephone in 1876 (Field, 1996) because the simple telephone has been used as a tool to facilitate audio communication between patients and physicians since its inception. Others credit the invention of the wireless radio, Morse code, and voice radio communications with aircraft, distant islands, and ships at sea during medical emergencies (Amenta & Rizzo, 1999; Rizzo et al., 1997; MacDonald, McNicholl, & Wootton, 1998). Telephone and wireless radio communications provided the first methods of transmitting voice messages over obstacles or at great distances.

Voice communication between patients and physicians was further augmented by the ability to transmit sounds and visual information. The first electrical transmission of the sound from a stethoscope was demonstrated in England in 1910 (Brown, 1910). This instrument provided the opportunity for a physician to remotely listen to the sounds of the patient's breathing, heart beat, or other bodily functions. The first reported transmission of an X-ray image occurred in 1950 after the invention of the television camera and monitor (Gershon-Cohen & Cooley, 1950). Some of the first specific references to
telemedicine were related to the transmission of video images of X-rays and two-way television in the early 1960’s (Jutra, 1959; Wittson, Afflect, & Johnson, 1961). However, most of these early attempts failed to succeed at reproducing image quality comparable to that of actual X-ray film or sound quality equal to direct patient interaction and therefore were not readily adopted by physicians (Bashshur, Sanders, & Shannon, 1997). Improvements in technical ability to transmit image, sound, and data electronically were necessary before physicians could rely on the technology for patient interaction. In recent years technology improvement has occurred as the result of the necessity to monitor human beings at a distance. Much of the progress toward the quality of current telemedicine technology has been attributed to early space research by the National Aeronautics and Space Administration (NASA), U.S. military, and correctional facilities. NASA developed remote sensing and transmitting technology to allow physicians on earth to monitor and communicate with astronauts in space. The U.S. Military developed and still uses some of the same technology to monitor the condition of wounded service men on the battlefield and extend communications between medics and front-line physicians to specialist physicians at tertiary medical centers (Williams et al., 2000; Nicogossian, Pober, & Roy, 2001). The federal correctional system has also developed telemedicine technology to extend access to health care to remotely incarcerated populations (Butler et al., 2001).

Uses of Telemedicine

Telemedicine is a powerful tool with immense potential to improve access to quality health care across geographic, time, and physical barriers. Enormous
opportunities exist to improve health care services using information and communication technologies to expand access to care, improve quality, increase efficiency, and reduce cost (Bashshur, 2002; Brown, 2003; Bynum, Cranford, Irwin, & Banken, 2006; Krupinski et al., 2002). The majority of physician-patient telemedicine encounters involve urban physicians assisting rural primary care physicians with the diagnosis and clinical management of patients in the rural community, frequently accomplished via live video conferencing directly with the patient. Video cameras capture the image of both the physician and patient, transmit images over dedicated telephone lines or the Internet, and reproduce live audio and video images on a television monitor located at each end of the communication. Other forms of patient and diagnostic information such as medical records, electrocardiograms, vital signs, medical images, and still photographs may also be transmitted and reproduced at either site using store-and-forward technology.

Clinical diagnostic tools can be adapted to the technology to allow the physician to use a stethoscope, otoscope, ophthalmoscope, or other clinical diagnostic tools remotely (Norris, 2002). The American Telemedicine Association (1999) reports more than 50 different medical subspecialties have successfully used telemedicine for distant patient encounters.

Benefits and Drawbacks

Benefits of using telemedicine for physician-patient encounters include improved access to patient information, the ability to provide care not previously deliverable at a remote site, better education opportunities for rural providers, improved quality control, patient screening programs, and reduced cost. Access to health care is also improved as
a result of faster access to specialist physicians. For patients, it is more convenient and saves time (Hjelm, 2005; Smith, 1996; Treister, 1998).

Telemedicine-based disease management has shown promise in improving access, quality, and better outcomes in blood pressure, glucose control (Bellazzi & Arcelloni, 2003; Rogers, Small, & Buchan, 2001), medication compliance, functional status, and quality of life (Kobb, Hoffman, Lodge, & Kline, 2003; Cherry, Moffatt, Rodrigues, & Dryden, 2002). Early and frequent remote interactions between patients and central patient monitoring systems can alert clinicians of changes in patient vital signs and symptoms before it becomes necessary for the patient to go to the emergency room or be hospitalized, thus reducing complications and cost. This early detection of symptoms can reduce the severity of complications through early treatment and reduce cost associated with trips to the hospital emergency room.

Potential drawbacks to using telemedicine include the breakdown in the fundamental personal relationship between the patient and the physician, lack of physical contact with the patient, loss of communication between health care professionals, and issues concerning the quality of electronic health information (Hjelm, 2005). The use of telemedicine for physician-patient communication and interaction only accommodates the senses of sight and hearing. Human touch and smell between patient and physician are not currently possible with today's technology. Hjelm (2005) identifies this as both a historical and contemporary drawback to the adoption of telemedicine by physicians who rely on their senses of touch and smell to aid in physical diagnosis and treatment. Other informal means of communication are also lost in the telemedicine encounter. Hallway conversations and informal socialization may be lost due to the narrow confines of the
telemedicine encounter. On balance, the research supports the concept that the benefits of telemedicine substantially outweigh the drawbacks (Hjelm, 2005; Smith, 1996; Treister, 1998) and that continued research will reduce or eliminate any remaining drawbacks over time (Yellowlees, 1997).

Historical Barriers to Adoption of Telemedicine

Some early investigations of telemedicine focused predominantly on the technological development of video conferencing (Perednia & Allen, 1995). And a few historical studies examined physician acceptance of technology but these studies were limited to the absence of technical understanding on the part of physicians and the poor quality of the audio and video images of patients (Allen, Hayes, Sadasivan, Williamson, & Wittman, 1995; Mitchell, Mitchell, & Disney, 1996; Mairinger, Gabl, Derwan, Mikuz, & Ferrer-Roca, 1996; Gschwendtner, Netzer, Mairinger, & Mairinger, 1997; Mairinger, Netzer, Schoner, & Gschwendtner, 1998).

Poor Technology

In the 1980's the development of telemedicine programs was impeded mostly by deficiencies in technology (Maheu, Whitten, & Allen, 2001). One of the first barriers to the use of telemedicine was related to the inability to receive and transmit high-speed digital information over great distances between urban and rural communities. Live video and quality photographic images required access to high-speed broadband telephone or Internet transmission capability, which simply did not exist in many rural communities until the early 21st century. This barrier has largely disappeared as advanced communications technology has become readily available to both urban and
rural physicians. Initially the equipment necessary for video conferencing was expensive, hard to find, unreliable, provided poor image quality, and generated high transmission costs. Current technology is much more readily accessible, reliable, significantly lower in price, and can generate high-quality images. Widespread local access to broadband data transmission has lowered the technological and cost barriers to adoption (Whitten & Davenport-Sypher, 2006; Darkins & Cary, 2000).

Reimbursement

Private health insurance companies and governmental health programs like Medicare and Medicaid were initially reluctant to reimburse for a telemedicine physician-patient encounter. The Association of Telehealth Service Providers (2004) report indicates that Medicare only started paying for telemedicine visits as a demonstration project in 4 states in 1996 and widespread reimbursement was not commonplace until 2000. Adequate public and commercial health insurance reimbursement for the use of telemedicine for physician-patient encounters has shown some improvement in recent years but for the most part has been inadequate to cover the cost of the technology (Whitten & Buis, 2005). Medicare now reimburses for remote patient face-to-face services via live video conferencing, non face-to-face services that can be conducted using photographic images, and home health services (CMS, 2007). These new Medicare payment rules have significantly increased the quantity and varieties of telemedicine applications and uses. Medicaid reimbursement for telemedicine services occurs on a state-by-state basis with the number of states paying for telemedicine services increasing each year. The activity and interest among commercial health insurance companies in reimbursing telemedicine encounters is also growing each year. If telemedicine services
are being paid they are compensated for at the same rate as a face-to-face patient-physician visit. Very few insurance or government payers are covering the additional cost of using televideo equipment with the visit.

In a survey conducted in 2005 by Dr. Pamela Whitten (2007) at Michigan State University for the American Telemedicine Association, 58% of 64 telemedicine provider organizations reported receiving reimbursement from private insurance companies for their services. This percentage was up 5% from a previous study completed 2 years earlier (Whitten & Buis, 2005). Additionally, Whitten (2007) found that 81% of these telemedicine providers were reimbursed at the same rate as traditional face-to-face encounters.

Privacy and Confidentiality

Some scholars have also attributed the lack of acceptance of telemedicine to the focus on patient privacy, confidentiality (Waters, 2002), and legal-regulatory concerns (Jennett et al., 2005; Doarn, 2004). Issues about protecting the privacy of patients and the confidentiality of their health information transmitted over public data lines and the Internet have been effectively addressed with the use of encryption software to protect information from unauthorized access (Steele, 2000). This software is located at both ends of the telemedicine communication and effectively scrambles video, sound, and data during transmission and reconstitutes the information at the other end. Even if someone were able to intercept the transmission, the software would prohibit anyone but an authorized user from reconstructing the encrypted video, sound, and data.
Legal and Regulatory Issues

Other barriers to the use of telemedicine are the legal and regulatory concerns associated with licensing of physicians to use telemedicine for patient encounters across state lines (Doarn, 2004; Yellowlees, 2005; Shannon et al., 2002) because licensing physicians to practice medicine is a function of the state board of medical examiners in each state. Many states have recently adopted mechanisms to license physicians for telemedicine patient encounters across state lines (Doarn, 2004). Similarly, hospitals and their medical staffs must credential or approve a physician’s use of telemedicine in the practice of medicine. In recent years, new policies and procedures have been developed to allow physicians to use telemedicine in their hospital practice (Brown, 2005).

Dissatisfaction

Finally, early studies by Balckmon, Kaak, & Ranseen (1997), and Mairinger, Gabl, Derwan, Mikuz, & Ferrer-Roca (1996) identified physician resistance to the adoption of telemedicine as being attributed to poor physician-patient satisfaction with the telemedicine encounter when compared to a face-to-face consult. More recently Krousel-Wood et al. (2001) and Whitten & Mackert (2005) conducted provider satisfaction studies that looked at overall acceptance and satisfaction with telemedicine programs by patients and physicians. These studies have consistently demonstrated a positive level of acceptance and satisfaction with telemedicine consults. The studies have also demonstrated improved satisfaction scores once a program has been established and has been running smoothly for a period of time thereby reversing the initial findings about physician-patient satisfaction. With the improvement in the quality of telemedicine equipment and physician-patient satisfaction scores, the question still remains as to why
more physicians have not adopted telemedicine into their clinical practices. Identifying and overcoming barriers to physician adoption of telemedicine is vital successful implementation of the technology.

Current Barriers to Adoption of Telemedicine

Many of the initial barriers identified in the literature have been resolved or diminished over time. The remaining barriers to physician adoption of telemedicine identified in the literature have been grouped by the researcher into nine major themes. The nine major themes include:

- Lack of knowledge and vision;
- Inadequately defined need for telemedicine;
- Lack of physician acceptance;
- Lack of clinician leaders or champions;
- Little or no administrative support;
- Low reimbursement and return on investment;
- The high cost of technology;
- Lack of technical expertise;
- Lack of scientific study about the adoption of telemedicine.

Lack of Knowledge and Vision

A fundamental premise for the adoption of any new technology is the ability to understand how it works and how it is used. Several studies have found that the lack of knowledge and understanding of telemedicine technology can hinder its development and use (Brebner, Brebner, & Ruddick-Bracken, 2005; Lam & Mackenzie C, 2005). Lam and
Mackenzie (2005) visited 30 military treatment facilities and interviewed 342 users of telemedicine. They interviewed three groups of individuals involved in telemedicine in the U.S. military: operators of the military telemedicine system, headquarters personnel who served as program managers, and clinical personnel at hospitals and clinics who might actively use the telemedicine system. They identified organizational factors such as poor planning, training, and lack of knowledge about the role of telemedicine as the primary factors leading to physician underutilization of telemedicine.

Spaulding, Russo, Cook, and Doolittle (2005) suggest that providers who are knowledgeable about telemedicine and its use are more likely to use telemedicine in the future. Spaulding et al. conducted a mail survey of 356 physicians and physician assistants in 20 counties in Kansas. The survey classified respondents as “adopters” defined as those providers who referred one or more patients to a telemedicine service or “non-adopters” of telemedicine and their expectations about using telemedicine were measured. Adopters were 53% more likely than non-adopters to use telemedicine in the future. Spaulding et al. concluded that adopters of telemedicine have different perceptions of telemedicine from those held by non-adopters. Adopters have more knowledge and a better sense of the value that telemedicine brings to their practice and to the patients they serve (Spaulding, Russo, Cook, & Doolittle, 2005). Alverson (2004) also suggested that knowledge, familiarity, and use of telemedicine technology improves physicians’ comfort with the equipment and probability of their using it for clinical consultations. He further suggested a best practice for improving comfort with the equipment is to find alternative non-clinical uses for the technology that allow physicians to practice and become more familiar with the equipment.
In addition to knowledge and understanding, several studies suggest that a lack of vision and specific goals for the successful implementation of telemedicine can also act as barriers to its acceptance and use (Yellowlees, 2005; Alverson et al., 2004; Shannon et al., 2002; Hopp et al., 2006). They argue that the absence of a specific vision and goals for the use of telemedicine makes it impossible for users to know how it should be used or if they are using it successfully. Therefore, it is important to establish a clear vision statement for what telemedicine is, the way it is to be used, and the goals or outcomes of successful implementation.

_Inadequately Defined Need_

Shannon et al. (2002); Yellowlees (1997); Brebner, Brebner, and Ruddick-Bracken (2005) affirmed that the lack of a specifically identified need for telemedicine is a barrier to its adoption. A telemedicine program driven only by technological imperatives is not likely to succeed. The needs must be assessed and identified from a clinical, economic, and technical perspective (Doolittle & Spaulding, 2006). Physicians must see an immediate benefit or a compelling need in order to adopt telemedicine and to continue to use it (Yellowlees, 2005, 1997).

The importance of completing an assessment to identify a specific need for its use is vitally important to its success and must include focus on both the urban and rural side of the technology (Alverson et al., 2004). Telemedicine technology is not an end in itself, but rather a tool to be applied to address a specific need or problem.

One study, completed by the Health Telematics Unit at the University of Calgary in Canada (Jennett et al., 2005), examined the concept of core readiness that includes the
attribute of having a recognized need for the service. Four telephone interviews were conducted with key informants who were identified only as having had considerable experience in rural telemedicine programs. Rural communities identified as having a specifically recognized need for the telemedicine services were described as being more successful at adopting telemedicine technology.

*Lack of Physician Acceptance*

The lack of physician acceptance of telemedicine described by Wootton in 1997 is still found in the current literature. Studies can be found that show positive attitudes towards the use of telemedicine (Hu, Jen-Hwa, & Yam-Keung, 1999) and proponents can certainly be found who believe telemedicine represents the future of health care (Bauer & Ringel, 1999). Conversely, opponents show evidence that telemedicine represents a threat to the traditional physician-patient relationship and demonstrate that physicians are still reluctant to adopt telemedicine as a means of providing care for their patients (Bulik, 2004). According to Hjelm (2005) and Hopp et al. (2006) physician-physician and physician-patient relationships are often perceived to be denigrated when conducted via telemedicine. Physician acceptance must exist on both the urban and rural side of the telemedicine encounter for success (Stanberry, 2000).

Best practices for overcoming provider reluctance to accept telemedicine include finding ways to make the technology easier to use, improving the quality of audio and video transmission, making telemedicine more convenient for the physician to use, and giving the physician some financial ownership in the system (Garfield & Watson, 2003). Another suggestion included the use of an aggressive marketing program as a means of
promoting telemedicine amongst the physicians, administrators, and other health care professionals (Alverson et al., 2004). Doolittle and Spaulding (2006) suggested the use of a nurse at the remote site to socialize with the patient, interview the patient, and make sure that the urban physician had all the information needed in advance of the telemedicine visit improved the productivity and efficiency of the encounter.

Lack of Physician Champions

The lack of a physician leader to serve as a champion for the use of telemedicine amongst other physicians is another barrier to adoption. A physician champion or medical director often has better rapport with other physicians. He or she utilizes the same language and can help peers overcome what they perceive as barriers to the adoption of telemedicine (Yellowlees, 2005; Alverson et al., 2004; Lam & Mackenzie, 2005; Garfield & Watson, 2003).

Ellis (2005) presented a compelling argument about the importance of having a physician champion to help advance the cause of telemedicine in remote Australia. She conducted multiple interviews with 12 key informants engaged in telemedicine between August 2002 and November 2003. A total of 77 interviews were analyzed, and her findings identified the presence of a physician champion was a significant predictor of the success of a telemedicine program. A telemedicine physician champion can assist in bridging the diverse and competing values and motivations of the clinical providers, policy-makers, managers, information technology personnel, and support staff.
Lack of Administrative Support

Shannon (2002) identified the lack of support from top-level administration or governance as a fundamental barrier to adoption and success of a telemedicine program. Without upper level administrative support for a telemedicine program, the program becomes lost in organizational and bureaucratic issues and red tape (Hjelm, 2005; Whittaker et al., 2004). Programs with a high degree of communication, engagement, and involvement of top leadership have a higher degree of success in competing for administrative attention and funding. One best practice reported by Alverson (2004) is the development of a detailed telemedicine implementation plan involving all the technical, administrative, and clinical stakeholders. Active involvement in developing the plan for a telemedicine program improves knowledge, understanding, and active engagement of top leadership.

Low Reimbursement and Return on Investment

Shannon et al. (2002) and Alverson et al. (2004) support the notion that successful telemedicine programs must have an acceptable level of reimbursement for the use of telemedicine in order to generate the revenue necessary to sustain the program. Physicians and hospitals will not support telemedicine without some assurance of a long-term means of financial support (Shannon et al., 2002; Alverson et al., 2004). Many telemedicine programs are frequently started with grants that provide the funds necessary to purchase equipment and transmission capability but ultimately fail when these funds diminish because they are not economically viable and self sustaining. An on-going
return on investment is considered vital to the success of a telemedicine program (Yellowlees, 2005).

A suggestion for securing the financial future of a telemedicine program is the use of a budget, financial monitoring, and cost-benefit analysis (Lam & Mackenzie, 2005; Brebner, Brebner, & Ruddick-Bracken, 2005). Programs that develop detailed budgets, monitor their financial performance against a budget, and complete a financial cost-benefit analysis of their operations before implementation are more likely to realize long-term success.

**High Cost of Technology**

A consistent theme in the literature is the fact that telemedicine video conferencing equipment, medical instrumentation, and data transmission lines are expensive to purchase and maintain. The high cost of the equipment, on-going maintenance expense, and rapid obsolescence of equipment are perceived as barriers to adoption of this technology (Hopp et al., 2006; Alverson et al., 2004; Lam & Mackenzie, 2005). Successful telemedicine programs have overcome this barrier by understanding the true costs associated with initial setup and ongoing operations. A key to their success is securing adequate funding from grants and reimbursement in order to acquire and maintain the technology. It is important to note that the long-term survival of a telemedicine program may be predicated upon the ability to obtain new grant funds so the resources will be available to purchase replacement equipment when newer, faster equipment becomes available.
Lack of Technical Expertise

Telemedicine programs depend highly on people with technological expertise. The absence of technical support personnel with the training and experience in setting up, maintaining, and trouble-shooting this technology is recognized as a major barrier to its use in several published studies (Hopp et al., 2006; Alverson et al., 2004; Lam & Mackenzie, 2005; Yellowlees, 1997). Equipment malfunctions and the sudden loss of telecommunications transmission are cited as reasons clinical personnel would give up on the use of telemedicine (Alverson et al., 2004; Demiris, Edison, & Schopp, 2004). A suggestion for overcoming this barrier was increasing the availability of technical support personnel and therefore the benefit they bring in making telemedicine as reliable and user-friendly as possible (Yellowlees, 2005; 1997).

Lack of Scientific Study

There is a lack of scientifically based studies examining the barriers to adoption of telemedicine in the literature. Most studies (Hjelm, 2005; Yellowlees, 2005: Brebner, Brebner, & Ruddick-Bracken, 2005; Yellowlees, 1997), while grounded in qualitative or quantitative theory, have been conducted on a rather limited sample size or were confined by the scope of the study to a particular program, region, state, or country. While the conclusions of these studies can be considered valid within the parameters established by their methodology, their scope is limited by the definition of the region or program studied, thus limiting their generalizability. Of particular note was one grounded theory study conducted by Helitzer, Heath, Maltrud, E., and Alverson (2003) at the University of New Mexico (UNM). The study surveyed four rural hospital sites to assess barriers to
adoption of telemedicine and contributors to successful adoption. A total of 31 interviews were conducted with program managers, physicians, and allied health providers within the confines of the New Mexico Telemedicine Network. The study used Everett Rogers' (1962/1995) diffusion of innovations theory as a framework for interpreting and understanding the results. The diffusion of innovations theory is a framework within which to describe the process by which an innovation like telemedicine is diffused and adopted by new users of the innovation (Rogers, 1962/1995). In this theory the term diffusion is used to describe the process of communication among the members of a social system about a new idea. The components of successful adoption of telemedicine were categorized in this study according to Rogers’ five characteristics of innovation: relative advantage, compatibility, complexity, observability, and trialability (Rogers, 1962; 1995).

Rogers’ (1962; 1995) theory states that the higher the perceived relative advantage of the innovation the more rapidly it will be adopted. The relative advantage of telemedicine was identified by key informants as the speed with which information could be shared. The specific example cited was the use of teleradiology (electronic transmission of an X-ray image) from one site to another for interpretation. Telemedicine technology significantly reduced the time necessary to present an X-ray image to a radiologist and receive a professional interpretation. Telemedicine was also reported as having a distinct advantage over in-person encounters for mental health consulting and psychiatric screening because the technology took less time and was more cost efficient than face-to-face encounter.
The greater the degree of compatibility between the innovation and the existing values, experience, and needs leads to a faster rate of adoption (Rogers, 1962; 1995). Key informants reported that telemedicine provided a mechanism to improve compatibility between rural and urban physicians' practice patterns. Closing the gap between urban and rural physicians aligned the standards of practice for both referring and consulting physicians and made the experience of the patient consistent.

The greater the degree of complexity in an innovation the more difficult it will be to understand and adopt (Rogers, 1962; 1995). The UNM study by Helitzer, Heath, Maltrud, and Alverson (2003) determined that telemedicine equipment was not very complex or difficult to learn and operate. While these results made its adoption and use relatively easy to accomplish, the study did report that a high turnover in staff at rural sites did create a constant need for training and technical assistance to keep the system operational.

Rogers (1962; 1995) stated that the more observable a new innovation is the easier the adoption. Telemedicine, by nature, is a visual technology. The ability to see and hear telemedicine in action contributes to the adoption by new users.

Rogers (1962; 1995) defined the characteristic of trialability as the degree to which an innovation can be tried or experimented with. The easier it is to experiment with the innovation the more readily it will be adopted. The UNM 2003 study cited an example of experimenting with a service that did not require a direct patient-physician interaction, such as teleradiology, to test telemedicine equipment.
Discussion

This review of the literature identified a number of common perceptions of barriers to the adoption of telemedicine and some helpful success factors and suggestions for overcoming these barriers. The review included a summary of the historical barriers to adoption of telemedicine as well as a summary of current barriers. A review of current and as yet unresolved barriers to adoption of telemedicine was categorized by the researcher into nine major themes:

- Lack of knowledge and vision;
- Inadequately defined need for telemedicine;
- Lack of physician acceptance;
- Lack of clinician leaders or champions;
- Little or no administrative support;
- Low reimbursement and return on investment;
- The high cost of technology;
- Lack of technical expertise;
- Lack of scientific study about the adoption of telemedicine.

This review of the literature identified a gap in the body of knowledge about barriers to adoption of telemedicine and best practices for overcoming these barriers. The gap exists due to a distinct absence of scientific study based multiple successful telemedicine programs. Most of the reported studies in the literature, while grounded in qualitative or quantitative theory, were conducted on a rather limited sample size or confined the study to a particular program, region, state or country. While the conclusions of these studies can be considered valid within the parameters established by
their methodology, the scope of study was always limited by the definition of the region or program studied. The purpose of this study is to close this gap in the research by conducting a grounded theory study to illuminate the experience of multiple successful telemedicine programs from different geographical locations of different sizes and circumstances to broaden the body of knowledge on the subject.

Conclusion

Chapter II reported on the results of a review of the literature identifying some of the perceived barriers to adoption of telemedicine and best practices for overcoming these barriers. The results of this review support the need for additional study of the issue from a multiple program perspective to expand the body of knowledge on the subject and support the use of the proposed key research questions:

1. What do successful telemedicine program managers and physicians perceive are the remaining barriers to adopting telemedicine into a medical practice?

2. What are their best practices for overcoming physician resistance to the adoption of telemedicine?

3. What insight or words of wisdom do these successful telemedicine program managers and physicians have to offer other health care professionals who are considering adopting telemedicine into their practices?

Chapter III will review the proposed methodology for answering these important questions. Chapter IV will present the results and findings of the study and Chapter V will provide a discussion of the results and their contribution to the body of knowledge on this topic.
CHAPTER III: METHODOLOGY

This chapter includes a description of the qualitative research design, a description of the method used to select key informants, and a discussion of the data collection and techniques for analyzing them. The chapter also includes a discussion of the limitations of the study and the approval process of the Institutional Review Board at the Medical University of South Carolina to ensure the protection of human subjects.

Research Design

This qualitative study is informed by grounded theory and focuses on interview sampling of key informants to elicit their experience with barriers to the adoption of telemedicine into the clinical practice of medicine and includes their recommendations for best practices to overcome these barriers. Key informants were screened to ensure that they were successfully using telemedicine in physician-patient encounters, defined as a program that conducted a minimum of, on average, one physician-patient video conferencing encounter per week for more than one year. The aim of this study is to gain an in-depth understanding of the factors that have contributed to the telemedicine programs’ success. Focused interviews were conducted with program managers and physicians associated with successful telemedicine programs with the intent of learning from their insights and experiences to elicit best practices for overcoming adoption barriers.

After a review of the general theoretical models for research of this type, grounded theory was determined to be the most appropriate model for this study (Glaser,
1978; Glaser & Strauss, 1967) because of its ability to develop insight from personal experience. Glaser (1978) suggests that grounded theory provides a means to transcend the gap between experience and understanding. Grounded theories are more likely to provide insight and enhance understanding when they can objectively be drawn from interview data (Bryant, 2002). Grounded theory should allow the researcher to explore and understand what is happening behind the behaviors and actions of certain individuals engaged in overcoming barriers to telemedicine implementation. It is important to note that for this model to be effective the data must emerge from the interviews and not be driven by the interviewer (Glaser, 1978). The researcher was conscious of this fact and used great caution not to interject personal opinion into the interviews. The study utilizes a qualitative grounded theory approach to identify and explore barriers to adoption and successes in the implementation of telemedicine technology for physician-patient interactions.

Selection of Key Informants

The population for this study included 78 individuals, 18 physicians and 60 program managers associated with 58 successful telemedicine programs throughout the U.S. Attention was taken in the selection of successful programs to invite individuals representing a broad distribution of geography, program size, urban, and rural situations.
Successful programs, managers and physicians were identified using the Telemedicine Information Exchange (TIE) website (http://trc.telemed.org/default.asp) and the Health Resources and Services Administration (HRSA) website that includes the HRSA Telehealth Grantee Directory (http://www.hrsa.gov/telehealth/grantee.htm).

The 2001 ATSP Report on U.S. Telemedicine Activity is a survey of the industry that identifies telemedicine programs by location, clinical services offered, and types of equipment used (The Association of Telehealth Service Providers, 2004). This website is called the Telemedicine Information Exchange (TIE) and is managed by the Association of Telehealth Services Providers (ATSP) and provides one of the most comprehensive directories of national and international telemedicine programs.

The HRSA Telehealth Grantee Directory also provides a rich source of information about successful telemedicine programs. The TIE and HRSA websites contain pertinent information necessary to identify the number of physician-patient encounters per year and the number of years each program has been in operation. This information was used as an initial screen to determine if the program was successful, given the workable definition for this project.

Seventy-eight individuals were identified as program managers or physicians of successful telemedicine programs. Successful telemedicine physicians were identified by their direct experience with the use of telemedicine in their clinical practice and successful program managers were identified by their unique insight in identifying and overcoming barriers to physician adoption of telemedicine. Letter or email communications (Appendix C) were sent to each of these individuals inviting them to participate in the study. Of the 78 individuals contacted, a total of 36 people responded
to the request to participate in an interview and be a part of this study, the response rate was 46.2%. Of the 36 people who agreed to participate in the study and further screening of candidates, a total of 32 telephone and face-to-face interviews were completed including 5 physicians and 27 program managers. Initial interview questions about the number of direct patient interactions per week and the age of the program served to verify that the key informants actually represented successful telemedicine programs. A total of 4 individuals were disqualified from the study because their program did not meet the criteria used to define a successful program.

Data Collection Procedure

Once key informants were identified and agreed to participate, appointments were scheduled to conduct the interview either in person or by telephone. All appointments were confirmed by phone or return email. Interviews were scheduled for 30-45 minutes and care was taken not to exceed the allotted time without the permission of the key informant.

Interview questions were derived to elucidate information about identified barriers to physician adoption of telemedicine, how these barriers were overcome, and what lessons learned should be shared with new and developing telemedicine programs. A reflexivity team was selected consisting of two physicians with extensive experience in organizing telemedicine programs to review and pilot-tested the survey questions before the research began. This guidance provided the researcher with an opportunity to practice interviewing key informants to ensure that the questions could be clearly interpreted and that they solicited the information desired. The reflexivity team was also
used to review intermediate results of the research and provide comment on final conclusions. An example of the interview guide and questions used in the study are included in this report as Appendix B.

All interviews included an explanation of how the interview would be conducted, and how the confidentiality of the key informant would be protected. Permission was obtained from the key informant to record the interview. All interviews were digitally recorded and a summary of the interview was prepared by the researcher. All personal identification information such as the name, addresses, and telephone number of each key informant was removed from each interview summary and the final report to protect the confidentiality of the participants. The informants were assured of the complete confidentiality of the information shared during the interview. No statements or comments are identified by the informant’s name or organization. The possible future uses of the information obtained in the study was also explained to the key informant to include the possibility of secondary data analysis, publication, and/or presentation at state or national professional association meetings and conferences.

Thank you letters or emails were sent to each key informant along with a copy of the summary of the interview.

Data Analysis

Glaser (1978) describes three stages in the development of a grounded theory: collection and interpretation of raw data assembled during the interview process; extraction of concepts to find theoretical meaning in the data; and the emergence of a grounded theory. Initially interviews were subjected to open coding to collect and
interpret the data, dividing the data into words or phrases with separate units of meaning. As an example, words like reimbursement, billings, payment, and revenue were identified in the summary and these keywords or phrases were connected to the participant’s description of the experience under study. Individual interviews were reviewed periodically throughout the study and memos developed to abstract concepts and to find theoretical meaning in the interview summaries. Key words related to reimbursement, billings or payment were then grouped into a “payment for services rendered” category referred to as axial coding. Axial coding is a process of grouping open codes together in a way that shows a relationship among them and helps the researcher categorize insights (Kendall, 1999).

Categories were then collected and accumulated based upon the frequency of mention. Categories were reviewed and linked by relationship, conditions, or dimensions that provide insight into major themes. For example, categories related to payment for services, cost benefit analysis, and return on investment were grouped into the major theme of financial performance. A greater or lesser value was then assigned to this theme based upon the relative importance assigned to it by the interviewees and the frequency of mention.

Data had to be collected in a manner that protected the theoretical sensitivity of the study and minimized the number of predetermined ideas or theories implied by the interviewer (Bryant, 2002). The researcher was careful not to interject personal opinion, conjecture, or even offer insights developed during the study into the coding and analysis of the interviews. Once the interview began, the researcher was careful to read directly from the interview guide and list of questions without recognizing responses or providing
leading questions or comments. Chiovitti and Piran (2003) emphasize the importance of letting the participants guide the inquiry process. The researcher kept a reminder of this statement in front of him throughout the interview process.

A written summary of each interview and the identified concepts was compiled and sent to each interviewee by US mail or e-mail along with a letter that requested that the interviewee review the summary and make comments, additions, and corrections to the summary as they deemed necessary. A self-addressed stamped envelope was provided for return comments when necessary. Interviewees were asked if the summary accurately reflected the content of the interview and key themes. This “member checking” process helped ensure that the researcher accurately summarized their viewpoint and drew appropriate conclusions from the interview. It provided an opportunity for these key informants to validate the categories and themes developed in the study. Fifty-six percent (18) of key informants returned comments as a result of this member checking process. Their comments and suggestions were included in the final summary of each interview. Field notes were written and analyzed after each interview to help the researcher focus on common and divergent themes of subsequent interviews. The researcher compared common and divergent themes between interviews to provide a logical framework to enhance understanding.

A peer-review process was also used to assure congruency of the study’s evaluation of the interviewees’ experience and perceptions. A colleague researcher listened to all recordings of the interviews and produced an independent summary and analysis of the concepts and major themes. There were no discrepancies identified in categories and themes between the key informants, researcher, and peer reviewer. The
researcher and peer reviewer also compared their independently identified major themes emerging from the interviews. With the exception of minor sentence structure, the major themes were determined to be consistent.

After 32 interviews, the researcher determined that the saturation point had been reached and that it was appropriate to end the study (Anderson, 1991). Any additional interviews would add nothing to what was already known about the topic, its properties, or relationship to the research questions. Thereafter no additional interviews were conducted.

Protection of Human Subjects

An application (HR# 16872) for Exempt Research/Quality Assessment Review was submitted to the Medical University of South Carolina Institutional Review Board on December 12, 2006. Approval for exempt status was received on January 10, 2007.

Conclusion

This chapter provided a description of the qualitative research design, a description of the method used to select key informants, and a discussion of the data collection and analysis techniques used. The chapter concluded with a discussion of the limitations of the study and the approval process of the Institutional Review Board at the Medical University of South Carolina to ensure the protection of human subjects. Chapter IV will present the results and findings of the study and Chapter V will provide a discussion of the results and their contribution to the body of knowledge on this topic.
CHAPTER IV: RESULTS

This qualitative study focuses on interview sampling of key informants to elicit their experience with physician barriers to the adoption of telemedicine and the best practices for overcoming these barriers. Key informants were screened to ensure that they were successfully using telemedicine in physician-patient encounters, defined as a program that conducted a minimum of, on average, one physician-patient video conferencing encounter per week for more than one year. The aim of this study is to gain an in-depth understanding of the factors that have contributed to the telemedicine programs’ success by conducting focused interviews with program managers and physicians involved in successful programs. Specifically the goal includes the intent of learning from their insights and experiences about barriers to adoption and use of telemedicine by physicians and to elicit best practices for overcoming these barriers.

Seventy-eight individuals were identified as program managers or physicians of 58 successful telemedicine programs. Letter or email communications (Appendix C) were sent to each of these individuals inviting them to participate in the study. Of the 78 individuals contacted, a total of 36 people responded to the request to participate in an interview and be part of this study, which yielded a response rate of 46.2%. Initial interview questions about the number of direct patient interactions per week and the age of the program served to verify that the key informants actually represented successful telemedicine programs. A total of 4 individuals were disqualified from the study because their program did not meet the criteria used to define a successful program. Of the 36
people who agreed to participate in the study, a total of 32 telephone and face-to-face interviews were completed including 5 physicians and 27 program managers.

The initial research proposal was designed to focus on physician interviews and initial interviews were conducted primarily with physician informants. The researcher determined that after the initial physician interviews the bulk of the insight into physician barriers to the adoption of telemedicine and best practices for overcoming these barriers was derived from interviews of program managers. Physicians were generally more interested in using the technology to enhance clinical interaction with patients and less interested in identifying barriers to adoption or how to overcome these barriers. Frequently, physician key informants would state, "I don't really care how the technology works or what it took to set-up the telemedicine visit, I just want it to work in my practice." Program managers, however, were keenly focused on identifying barriers to physician adoption and solving issues related to helping physicians adopt the technology. Program manager interviews yielded a wealth of experience and information about physician barriers and how to overcome them. The researcher determined that more information would be obtained by interviewing successful program managers and changed the focus of the study to include a preponderance of program managers without eliminating the contribution of physician key informants.

The training and experience of program managers varied significantly as demonstrated in Table 1. A slight majority of successful telemedicine program managers reported clinical medical training. However, insight obtained in the study did not appear to be correlated with clinical training. Fifty-nine percent of key informants are identified
as male in the study. The distribution of key informants was designed to eliminate the potential of bias based upon training and sex.

Table 1. Distribution of program manager key informants by occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number</th>
<th>Percent</th>
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<tbody>
<tr>
<td>RN</td>
<td>9</td>
<td>28%</td>
</tr>
<tr>
<td>Administrator</td>
<td>7</td>
<td>22%</td>
</tr>
<tr>
<td>Physician</td>
<td>5</td>
<td>16%</td>
</tr>
<tr>
<td>Technical</td>
<td>5</td>
<td>16%</td>
</tr>
<tr>
<td>Education</td>
<td>3</td>
<td>9%</td>
</tr>
<tr>
<td>Other Clinical</td>
<td>3</td>
<td>9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td></td>
</tr>
</tbody>
</table>

| Clinical | 17 | 53% |
| Non-clinical | 15 | 47% |
| **Total** | **32** |     |

| Male | 19 | 59% |
| Female | 13 | 41% |
| **Total** | **32** |     |

Attention was addressed to select key informants from different parts of the country to eliminate the potential of geographic bias. Most of the prior studies on this topic were limited to a small geographic area or within a specific program (Hjelm, 2005; Yellowlees, 2005; Brebner, Brebner, & Ruddick-Bracken, 2005; Yellowlees, 1997; Alverson 2003). Figure 1 graphically demonstrates the national distribution of key informants in this study throughout the U.S. This distribution was used to eliminate the potential of bias associated with geographic location.
Table 2 presents the distribution of key informants based upon urban, rural, large medical center, and small rural hospitals. This distribution was used to eliminate bias associated with hospital size and location. The insight obtained from key informants did not reflect a bias based upon hospital size or location.
Table 2. Distribution of key informants by urban, rural, large medical center, and small hospital.

<table>
<thead>
<tr>
<th>Distribution of Key Informants</th>
<th>Number of Interviews</th>
<th>Percent</th>
</tr>
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<tbody>
<tr>
<td>Urban</td>
<td>14</td>
<td>22%</td>
</tr>
<tr>
<td>Rural</td>
<td>18</td>
<td>28%</td>
</tr>
<tr>
<td>Large Medical Center, &gt; 100 beds</td>
<td>15</td>
<td>23%</td>
</tr>
<tr>
<td>Small Hospital, &lt; 100 beds</td>
<td>17</td>
<td>27%</td>
</tr>
</tbody>
</table>

* n = 32

The researcher listened to digital recordings of each interview and prepared a summary of the interviewee’s answers to each question. A peer researcher was engaged to listen to each interview, prepare an independent summary, and independently identify common themes emerging from the interviews. The peer review summary was compared to the researchers’ and together a summary of each interview was prepared that included all the agreed upon elements of both parties. This combined summary was sent to the interviewees along with a request that he or she review the summary for accuracy and completeness (Appendix D). The interviewee was encouraged to return comments and suggestions by mail or email to be incorporated into the final summary as a member checking process. The final interview summaries used in this study only contain the content agreed upon by the researcher, peer reviewer, and interviewee to eliminate any potential bias by either researcher or peer reviewer.

The final interview summaries were open coded, or the data divided into key words or phrases with separate units of meaning, to collect and interpret the data (Bryant,
For example, words and phrases like equipment failure, audio loss, poor picture, and dropped connection were identified and underlined in the interview summary. This process allowed for the recognition of keywords or phrases which connect the participants' description of the experience under study with abstract concepts resulting in theoretical meaning in the interview summaries. These concepts were then collected into categories so that key words or phrases such as equipment failure, audio loss, poor picture, or dropped connection where grouped into an equipment quality category. This process, referred to as axial coding, involves grouping open codes together in a way that shows a relationship among them and provides categories of insight for analysis (Kendall, 1999).

Categories were then collected and accumulated based upon the frequency of occurrence and linked by relationship, conditions, or dimensions to reveal major themes (Glaser, 1978). For example, categories related to equipment quality, reliability, and connectivity were grouped into the major theme of technology. Each category was then assigned greater or lesser value based upon the importance given to it by the interviewees and the frequency of occurrence. A comparison was made of the major themes identified by the researcher and those independently identified by the peer reviewer. With the exception of some minor sentence structure, the themes identified by the researcher and peer reviewer were determined to be consistent.

The results of this study are organized by research question and listed by major theme within each question. This framework provides an opportunity to analyze the content of the interviews in context with the questions under study. The research questions identified for this study included:
1. What do successful telemedicine program managers and physicians perceive are the remaining barriers to adopting telemedicine into a medical practice?

2. What are their best practices for overcoming physician resistance to the adoption of telemedicine?

3. What insight or words of wisdom do these successful telemedicine program managers and physicians have to offer other health care professionals who are considering adopting telemedicine into their practices?

Research Question Number One: What do you perceive were the barriers to adopting telemedicine into a medical practice?

The barriers to adoption of telemedicine identified in this study emerged in five major themes: time, money, physician engagement, technology, and understanding. Each theme is explored separately and relevant quotations are included giving a voice to the participants.

Time

Categories of barriers clustered around the theme of time included the concept of the efficient use of a physicians' time and the fact that physicians were frequently described as being too time challenged to learn how to use new technology. Physicians are extremely busy people and anything that takes time away from the practice of medicine is seen as a distraction to be avoided. Physicians are also aware of the need to be as productive as possible with their time because income is directly proportional to the number of patient visits they complete in a work day. An initial physician interview suggested that there may be a difference in the significance of this barrier based upon
whether a physician was in private practice or employed. This physician stated, "Employed physicians may be insulated from the need to be productive based upon their employment." Other interviewees discounted this notion stating, "Most employed physicians receive a significant amount of their income from productivity incentives." Payment incentives based upon the number of patients seen or the volume of revenue generated still provide a significant incentive for employed physicians to be mindful of the efficient use of their time. The inefficiency created by having to learn how to use a new technology in their clinical practice acts as a significant barrier to its adoption. Frequent comments were made about how telemedicine can be cumbersome and an inefficient use of the physician's time. One urban program manager described this inefficiency as, "We've learned that if the physician has to disrupt the routine flow of his practice to use telemedicine then he will be reluctant to use it." This disruption can be as simple as having to leave the clinic and travel to the hospital or a separate telemedicine suite, even if contained within the same building. Anything that takes the physician out of the normal routine of the clinical practice introduces an element of inefficiency and produces reluctance on the part of the physician to use telemedicine.

The same barrier was found to exist for rural physicians. One rural hospital administrator stated:

*Telemedicine is also seen as limiting the physician's ability to move around. It feels very static. The doc has to be scheduled to go into a room and or have somebody help coordinate the visit. All the pieces and parts of the visit have to be ready. They don't see the value of telemedicine in relationship to the administrative time that it takes.*
Most physicians must be efficient with their time. Their time is directly proportional to their income and anything that adds unproductive time to their day is considered an obstacle and annoyance.

Physicians on both the rural and urban end of telemedicine are frequently described as too busy to learn how to use the technology. One telemedicine program manager said, "Physicians are extremely busy. They are in short supply in both the urban and rural markets. The physician shortage is a big barrier. Physicians simply don't have time to try something new." Physicians today are under tremendous pressure to be productive with their time. Urban specialists are already busy enough not to be interested in taking new patients. Finding physicians with excess capacity and convincing them that it is worth their time is a challenge. He went on to say, "With cutbacks in payment for physician office visits they feel a lot of pressure to see more patients in a day just to maintain their current level of income and this is the same for employed and private practice physicians." The most prevalent theme relative to barriers to the adoption of telemedicine was that of time. Physicians were described as not having enough time to learn how to use the new technology and as being skeptical because of perceived inefficiencies associated with its use.

Money

Categories clustered around a monetary theme included the cost of providing a telemedicine service, coding, billing, and reimbursement. Most physicians survive on a small financial margin. They must be productive with their time, manage their operating costs, and generate enough revenue to realize a reasonable profit. A telemedicine
physician-patient encounter must be coded and billed correctly before the patient, or their insurance company, will reimburse for the service. According to the survey responses, the financial success of a telemedicine program is based upon the ability of the telemedicine provider to code correctly and bill for the service. One program manager described this barrier as, "Coding and billing is an issue. As you know, all health care insurance companies have adopted a uniform numerical system for coding services. Without the correct code attached to the bill they won't pay for the service.” While most doctors offices know the correct codes to use for a regular physician office visits, they don’t often know how to code and bill for a telemedicine visit. This telemedicine manager went on to say, “The coding and billing can get complicated for a telemedicine patient visit and some of our physicians have dropped out of telemedicine because of poor reimbursement.” Applying the correct codes and billing for a telemedicine visit can be difficult if the physician and his or her office staff do not understand how to do it correctly. This can cause a significant delay in receiving payment for services rendered and often causes the physician to be under paid for the service.

In addition to being able to code and bill for a telemedicine visit, the amount of reimbursement received for the visit is often reported to be inadequate to cover the cost. One telemedicine program manager said, “The reimbursement for a telemedicine encounter is exactly the same as seeing the patient in person.” The problem is that it costs more and generally takes a little longer than a face-to-face visit so there is no financial incentive to use telemedicine to see the patient.” Very few health insurance companies were reported to increase the amount of reimbursement to compensate for the additional cost of the equipment and transmission lines used for the telemedicine visit.
Several managers reported using grant money to help support the amount of physician reimbursement for telemedicine physician services. This can help a new program get started but can also present a problem when the grant support is completed. One program manager went on to say, “Everybody wants telemedicine as long as it’s free but when the grant money runs out everybody loses interest.” The fact that a telemedicine physician visit is reportedly more costly to provide, requires different coding and billing procedures, and is reimbursed at the same level as a normal face-to-face patient visit all combine to present a major monetary barrier to the adoption of telemedicine.

In addition to the steps necessary to receive reimbursement for a telemedicine encounter, the total cost of a telemedicine program was frequently reported to be a barrier to adoption. This cost includes equipment, transmission lines, and the personnel necessary to manage and maintain the televideo equipment. The cost of telemedicine equipment has decreased over time but still remains a significant investment. Program managers report the cost of a basic telemedicine suite to be anywhere from $5,000 to $25,000 depending upon the quality of the video image and kind of medical diagnostic equipment required. One program manager described the range of cost as follows:

*We have Psychologists doing telemedicine consults with patients in rural communities. The quality of the video and audio necessary for this kind of visit is very basic. We’ve placed a camera on the Psychologist’s desk top computer for less than $500. The remote end of the system can also be very basic unless the rural telemedicine site will be used for other doctors that require a higher level of image quality. The most expensive set-up for us is our wound clinic. In this case the Dermatologist has to be able to see a very detailed image of the wound from*
the remote site. We use a high resolution camera at the rural site and a high quality video monitor on the physicians end because we have to keep the quality of the images high so the doctor can see the detailed images he says he wants and needs. In all we spend about $25,000 on each of these sites just on equipment.

Key informants described the difficulty in keeping up with the inflation in practice operating costs and declining physician reimbursement. One clinic manager said, “The rising cost of equipment and personnel combined with the decline in physician payment, leaves very little money to invest in the equipment necessary for telemedicine.” Another cost barrier associated with the use of telemedicine is the cost of transmission lines that connect the equipment located at both ends of the encounter. Several telemedicine program managers reported that the cost of the communications lines between $600-1,000 per month. Most physicians reported that they needed to see an increase in reimbursement before they would be able to afford to adopt telemedicine into their practice.

Operating rural or remote telemedicine sites is reported by informants as requiring a higher total cost than an urban site. As one rural program manager put it, “Physicians at the urban center are usually self sufficient in front of the video camera while the remote site also has to pay someone to help with the telemedicine exams.” At the remote site the patient has to make an appointment with a scheduler, and the scheduler has to coordinate schedules for the physician, exam room, and equipment. The patient has to be received at the remote site, registered in the computer system, have vital signs taken, and escorted to a telemedicine equipped exam room, before the session can begin. This additional operating cost to the rural telemedicine provider can act as a further deterrent
to developing and maintaining a program. Some rural facilities reportedly have tried to bill insurance companies for the additional cost of the telemedicine encounter, but the majority of insurance companies refuse to reimburse a facility fee in addition to the office visit. Many telemedicine providers report using grants to help underwrite the additional cost or justify the expense as a community benefit.

Physician Engagement

The third most frequently mentioned theme was the lack of physician engagement in the adoption of telemedicine. Categories of barriers clustered around this major theme included resistance to change, lack of a defined need, lack of physician leadership, the loss of the face-to-face physician-patient encounter, rural physicians' fear of losing patients, the absence of standards for the use of telemedicine, and licensure requirement to practice across state lines.

Frequently interviewees reported physician resistance to change as a barrier to adoption of telemedicine. This resistance was best described by one telemedicine physician as follows:

*Physicians are creatures of habit. Physicians who have done things a certain way for a certain amount of time and find that it's working well feel like saying, 'why change what's working well?' Most of us physicians, especially in rural communities, are not likely to adopt something new just because it's new.*

Rural physicians prefer to have others experiment with new innovations. One rural physician said, "The more we see things used in every day practice of medicine, the more we will be likely to use it ourselves." This natural resistance to try something new will
act as a significant barrier until the use of telemedicine becomes more commonplace. Unfortunately, there may not be enough time to wait for the common adoption of telemedicine and rural communities may experience access and quality problems in the next 5-10 years.

Physicians commented that they are reluctant to try something new unless they see a specifically defined need for the new technology. A very successful program manager described this theme as, “Physician engagement starts with a highly visible identified need that is important to them.” Starting a program with a specific solution in mind without defining the need for the program was described as a barrier to adoption. She went on to say, “You need to start out with an understanding of what are your needs and then progress to answer the question ‘how do we solve this problem with telemedicine’?” The barrier becomes the lack of imagination in figuring out how to solve the problem using telemedicine. Key informants described the involvement of physicians in identifying specific needs as key to stimulating their interest and cooperation with the development of telemedicine services.

One of the most frequently identified barriers to physicians adopting and using telemedicine in their practice was identified as a lack of physician leadership. This concept of physician leadership was most frequently described as a lack of a physician champion. When asked to further describe what was meant by physician champion, one physician stated:

*You have to have a physician champion who is passionate to use the technology. Without one it is very difficult to sustain a program. The physician leader or champion is the guy that gets out there, talks to rural physicians, and helps them*
find solutions to their problems. No one can talk to docs like another doc. We've had telemedicine clinics for many years and it's easily duplicable so why aren't there more of them? It's a lack of physician-driven leadership.

The role of a physician champion is reported to be easy to explain but finding a physician to serve in the role is extremely difficult. As one program manager states, "Everyone sees the need for a physician champion but no one has the time to do it." The time necessary to fulfill this role is a challenge and one of the most difficult barriers to overcome.

Physicians frequently lament the loss of the face-to-face physician-patient encounter. One telemedicine physician said, "If this aspect of a physicians practice is extremely valuable to the physician then it will act as a significant barrier to adoption and frequently cause a physician to reject the program." The practice of medicine has always involved the personal attention and physical presence of the physician. Accepting the reality of an electronic patient visit will take time and practice before the physician feels comfortable using this technology.

Several key informants reported that a rural physician's fear of losing patients to urban specialist physicians was also a barrier to adoption of telemedicine. One urban telemedicine program manager described this barrier as follows:

There can be misconceptions about telemedicine. Some of our small rural hospitals and physicians shy away from telemedicine services because they are afraid that it will take their patients away from them. If they only understood how much it can improve access to care and keep patients in the local community this wouldn't be such a barrier.
Convincing a rural physician that the use of telemedicine can be a significant factor in helping keep patients in a rural community and their practice will be necessary to overcome this barrier. One rural physician said, “Telemedicine gives the specialist physicians access to our rural patients that may not normally have traveled to the big city to see them.” Once the patient establishes a relationship with the urban physician it becomes easier to travel to see this physician for follow-up visits and other health problems. He further described this phenomenon as follows:

*It often depends upon the character of the city doc. Some of them are mindful of this issue and refer patients back to their local doc for the things we can do. Others are in it for all they can get and often continue to treat patients themselves or send them to one of their city colleagues for things we could do right here at home.*

Urban telemedicine physicians have to be engaged enough in the process to be able to deliver quality service and support the local physicians. Many of the successful telemedicine physicians reported taking extra time and effort to respect the abilities of their rural counterparts and ensure that patients were returned to the local physician for services they can provide.

Several telemedicine program managers and physicians alike reported the absence of standards for the use of telemedicine as a potential barrier to its use. One rural physician stated that “There are very little standards or guidance for the use of telemedicine. A lot of physicians are waiting for standards of practice. They feel a lot safer and more confident if they can refer to some sort of standard.” It was further described as being no different than adopting a new diagnostic instrument in the
physician's office. Physicians will need time to learn about the new instrument, read the operating manual, and practice with it before they feel comfortable using it on a patient. Attempting to use a new instrument without an operating manual is no different than attempting to use telemedicine without a standard for its use.

The last category associated with the theme physician engagement is that of physician licensure across state lines. This barrier was most frequently mentioned by informants associated with large academic medical centers in the study. Many of the telemedicine programs throughout the country were developed by academic medical centers to help provide access to specialist physicians by remote or rural communities. When this academic medical center was located close to a state border then the issue of licensing their physicians to practice in neighboring states became an issue. One of these program managers stated, “Patients tend to travel to the closest academic medical center for services they need regardless of state lines”. The problem does not exist when the patient travels across state lines to see a physician in a neighboring state. The problem emerges when a physician uses a telemedicine program to see patients across state lines. He went on to say, “The medical center physician seeing a patient by remote televideo may not be licensed to practice medicine in another state and the process of getting a license in another state is seen as a significant barrier.” Obtaining a license to practice medicine in another state can be a daunting task. Frequently the physician must provide a significant amount of information about his or her training and certifications. This information can take a significant amount of time to collect and take a considerable amount of time to process before obtaining a license. It becomes easier to have the patient travel to the physician than for the physician to apply for another medical license.
Technology barriers to the adoption of telemedicine include the quality of the technology, lack of connectivity, and the absence of technical expertise. Significant improvements have been made in the quality of telemedicine equipment and the availability of high-speed data transmission, yet the quality of the video encounter is not that of a face-to-face visit. This theme is best summarized by a telemedicine program manager when he said, “We believe that telemedicine technology is becoming less and less of a barrier. The technology is becoming simpler to set up and use.” The real technical issues are related to the quality and reliability of the equipment, the transmission of information. He further said that, “You have to have the personnel to troubleshoot and fix it when it goes down.” The quality of the telemedicine equipment and its ability to produce a quality image of a remote patient is extremely important to the user physicians. Poor quality equipment is seen as a significant barrier to its use. One physician described this issue as:

One of the major push backs from the physicians has been the expectation that the video will be of clinical quality. Their expectation is that the quality of the diagnostics would allow them to zoom in on the patient and do the diagnostics remotely just like it is in the office setting.

The quality of video images during a telemedicine encounter has been a significant barrier to adoption. New high-definition equipment holds a lot of promise for overcoming this barrier. One program manager said, “We have converted all our video equipment to high-definition and it has made a significant difference in physician acceptance.” Converting to high-definition video equipment is seen as a means of
eliminating one more reason for physicians to avoid its use. Incremental changes in improving the quality of video imagery is seen as another means of overcoming physician resistance to adoption of telemedicine.

The lack of connectivity between telemedicine programs and providers is seen as a barrier also. One program manager summed this issue best when she said:

*The different networks like the health department, bioterrorism, urban hospitals, and competing health care systems don’t all talk to each other. They often have different firewalls and don’t trust each other so it gets difficult to impossible to cross over from one telemedicine network to another.*

Many telemedicine visits are reported to be transmitted over private communication lines. These lines may or may not cross connect between hospitals and physicians. One physician described the situation as, “I can have the latest equipment in my office but if my communication lines don’t connect me to my preferred specialist physician then it’s useless.” Building telemedicine networks with multiple communication connections and the ability to communicate with anyone at anytime will be important to overcoming this barrier. Several successful telemedicine program managers described their efforts to move their video communications to the Internet as a means of overcoming this barrier.

In addition to the inability to communicate between networks many key informants identified the absence of technical expertise and support as a barrier. As one program manager said, “You can buy the best equipment you can find, get the docs to use it, but if you don’t have the technical people to be able to keep the system up and running on a full-time basis you’ll fail.” One interviewee stated that, “There is nothing more frustrating to a physician than to be ready to see a patient over your telemedicine system.
and then have the system fail to work properly." Technical experts must be engaged in both setting up and maintaining the equipment necessary to complete a telemedicine encounter. Without these experts the equipment is often reported to be of poor quality and unreliable.

Understanding

A clear theme that emerged from the interviews was the lack of knowledge and understanding about telemedicine equipment and the way to use it. One program manager said, "When you say 'telemedicine' to many people they really don't understand what they can or can't do with it." This lack of understanding can be a formidable barrier to its use. A rural physician champion said, "Having the physicians understand it and its benefits both clinically and economically is important to its success." An academic medical center physician champion and educator described this barrier as follows:

> You have to understand that while our current medical school students and residents use computers and technology every day, many physicians still lack the basic understanding of computers and technology to be able to adopt and use telemedicine. In my opinion, most of these physicians are older and never had to learn how to use a computer in their every day practice or they work in rural communities where they can't afford to adopt technology. They become resistant to the adoption of telemedicine not because they can't learn how to use it but because they don't understand the benefits it can bring to their practice and don't want to learn anything new.
This lack of basic understanding about telemedicine must be overcome before physicians will readily adopt the technology. One physician suggested, “We’ve integrated a basic telemedicine course into our medical school curriculum but these students are still years from entering the practice of medicine.” Strategies will also need to be developed to provide opportunities for practicing physicians to learn about telemedicine and its uses.

Research Question Two: How did you overcome these barriers?

The responses to the question of suggestions for overcoming barriers provide insights that may improve physician adoption of telemedicine. This insight comes from the key informants described in the methodology and is based on the experience of successful telemedicine program managers and physicians from throughout the country. Several suggestions about how to overcome identified barriers to the adoption of telemedicine emerged and they include: time, money, physician engagement, technology, and understanding.

Time

The emerging theme related to time includes the concept of the inefficient use of physicians’ time and the fact that physicians at urban and rural sites are frequently too busy to adopt the technology into their practice. Key informants identified inefficiency as a major barrier to the adoption of telemedicine. Anything that disrupts or delays the physician-patient visit will reduce the number of patient visits that can be accomplished in a day. This reduction in number of patient visits has a negative impact on revenue production as a result of the inefficient use of the physician’s time. Several key
informants reported efforts to study how telemedicine was used in an effort to find ways of making telemedicine more efficient. One program manager described his study efforts as, “We decided to study the detailed workflow of the physician’s office. Physicians using telemedicine must be able to produce value and integrate it into their workflow.” There must be savings in either time or money and results must be evident in a short time frame. This workflow study was focused on finding ways to integrate telemedicine into the normal flow of the physician’s clinic practice. One program manager said, “We don’t look at it as trying to make the physician change the way he practices to use telemedicine, but look at ways to change telemedicine to fit the way he practices.” Assimilating telemedicine into the physicians practice routine will be important to overcome this barrier.

Many key informants described the inefficiency of telemedicine as being associated with a lack of preparation for the visit by patients and physicians on both ends of a telemedicine encounter. Urban physicians need to understand that an efficient telemedicine visit will require some preparation. One program manager described this preparation as, “The physicians have to come to the telemedicine visit prepared.” Physicians need to review the patient’s medical record and diagnostic information in advance of the visit to be efficient with their time during the telemedicine encounter. The program manager went on to say, “The last thing we want the physician to do is sit in front of the televideo equipment reviewing information he should have already seen.” The same level of preparation was also described as being necessary on the remote end of the telemedicine visit to help the urban physician prepare for the visit. This preparation includes making sure that the urban physician has all the pertinent patient information in
advance of the actual patient visit. Most physician practices in rural areas do not have electronic medical records and rely upon the traditional paper record in the local physicians’ office. An urban physician preparing for a telemedicine patient visit does not have access to the paper record and must rely upon someone at the remote site to find the pertinent patient information and relay this information to the urban physician. This local preparation for a telemedicine physician-patient visit was described by a remote program manager as follows:

We developed telemedicine referral protocols and guidelines that identified all the information necessary to make a telemedicine visit a quality visit. We identified the necessary lab and diagnostic tests that needed to be done and made sure it got to the specialist physician before the telemedicine visit. When all the information was present the specialists told us that the telemedicine visit was much more coordinated and efficient than their ordinary visits and it was a joy to work with.

The prevalence of electronic medical records and adequate preparation for the telemedicine encounter will be important to make a telemedicine visit an efficient use of the physician’s time and overcoming this barrier.

Key informants identified a large amount of inefficiency at the remote site with the absence of someone to facilitate the patient’s interaction with the telemedicine visit. One program manager described this issue this way:

Some people just don’t understand that it’s not like a face-to-face doctor visit. You can’t just park a patient in a room with televideo equipment and expect that the visit will go well. You have to put someone at the far end of the televideo visit to coordinate, present patients, and take orders from the physicians. This must be
Successful telemedicine programs reported extensive procedures for identifying patient presenters and orienting them to the specialist’s routine. They use nurse practitioners or physician assistants for this job. They also bring this remote presenter into the specialist’s office and give them time to work with the specialist physician before using them to present patients at the remote site. This helps them understand what the doctor wants and needs prior to helping him see patients.

One key informant suggested that success in making telemedicine visits more efficient can be attributed to identifying and pursuing telemedicine applications that could potentially save time. He described the experience as follows:

*We need to pursue telemedicine applications that provide a proven cost or time savings for the physician. One of the applications we found was telepathology. Telepathology systems send the image from the pathologist’s microscope to the operating room where the pathologist and surgeon can talk about and see the images without the surgeon having to break scrub and go down to the lab and talk to the pathologist. This application saves the surgeon time and saves the patient time under anesthesia. We think that saving the physician time and money is the key to success.*

Successful telemedicine program managers reported starting with applications that were identified as saving the physician time and money. These applications then served to convince other physicians that telemedicine was a useful tool and worthy of adoption.
In addition to finding ways to make the telemedicine visit more efficient many key informants also suggest ways to save time by either bringing the equipment closer to the physician or actually placing the equipment within the physician’s clinic practice. Key informants describe efforts to bring their telemedicine equipment closer to the physician by placing the equipment in close proximity to the hospital’s inpatient nursing unit. One program manager said, “We tried to time the telemedicine visits with the physician making rounds in the hospital.” This strategy saved the physician time in having to travel back to the hospital later in the day to complete his telemedicine visits. This tactic was also mentioned by telemedicine providers who place their equipment in special rooms or suites within the physician’s medical office building, allowing the physician to limit travel from the private office to the telemedicine suite to see patients.

Half of the key informants interviewed (16) identified the practice of fully integrating telemedicine equipment into the physician’s office practice as one of the best ways to overcome the barrier of inefficiency. One of these program managers described how this was done by saying, “We made telemedicine as convenient as possible by integrating it into their clinic and the way they do everything on a daily basis.” She described placing flat screen video monitors into two exam rooms in their clinic practice. These video exam rooms would then be scheduled using their normal scheduling system in exactly the same way they schedule patients. She went on to say, “Everything was handled the same except that the physician and patient were on the screen and not in person. It just mimicked the way that they normally saw a patient.” Fully integrating the use of telemedicine into the exam rooms of physicians was seen as a best practice for overcoming resistance to adoption.
In addition to overcoming inefficiencies related to the time it takes to use telemedicine equipment, key informants also identify the fact that physicians are too busy to use telemedicine as a barrier. Suggestions for overcoming this barrier included creating ways to free time in the physician’s day to accommodate telemedicine visits by improving scheduling, increasing productivity, and getting to new physicians before they become too time-consuming.

One program manager suggested that a physician could find more time to see telemedicine patients by making improvements in scheduling. She described taking over scheduling telemedicine patients for their physicians and found that improving the scheduling function was a major contributor towards facilitating physician adoption of the technology. She said, “Physician’s office staff understood how to schedule the doctor and an exam room however, they didn’t understand that for a telemedicine encounter they needed to schedule the room, equipment, and someone to greet the patient on the remote end.” Facilitating scheduling for a physician’s office eliminated the additional steps necessary for a telemedicine visit and returned the physician office personnel to their normal routine. Simply adding a couple of additional steps to their routine was seen as a barrier to adoption.

Another tactic for convincing physicians that they have time to practice telemedicine is to help them understand that telemedicine can help make them more productive. One manager used the fact that there was a shortage of physicians as a means of helping physicians adopt telemedicine into their practice. He said, “Used properly, telemedicine can make a physician more productive in his office and save him the time necessary to travel to a distant site.” This concept of improved productivity is also
described by one urban physician leader. He said, "We demonstrate to the physician that by using telemedicine they are expanding their catchment area from which to draw patients, increasing their patient referrals for services, and making better use of their time." Urban specialist physicians spend less time taking care of patients than other physicians who can handle and focus their attention on more complicated cases. He went on to say, "Since they spend more time providing a higher level of care they are more productive and generate more revenue." It is important to note that the urban program managers also identified expanding the physician’s catchment area as an important opportunity for overcoming their resistance to adoption of telemedicine. As time-consuming as urban specialists are, there is still interest in expanding opportunities to see new patients. Identifying aspects of the use of telemedicine that improve efficiency or expand opportunities for growth are important suggestions for overcoming resistance to adoption.

Finally, several key informants suggest that one way to address the complaint that physicians believe they are too active to practice telemedicine is to engage them in the process when they are new to their practice and before they become busy. One physician said, "We are concentrating on new doctors coming into town. We want to get to them before their practice is full and make sure telemedicine is a normal part of how they establish and grow their new practice." Most new physicians are interested in finding new opportunities to develop their practice. Targeting new physicians for the use of telemedicine is a great way to develop their new practice and introduce them to the use of telemedicine.
Money

The barriers to adoption of telemedicine associated with the issue of money were reported as the cost of providing telemedicine services, coding, billing, and reimbursement. Some of the suggested best practices for overcoming these barriers are finding new ways of funding the cost of equipment, realizing the normal decline in the cost of technology over time, and partnering with other organizations to find cost savings.

Finding new ways of funding equipment is described as a best practice for overcoming the barrier of cost. One program manager suggested, “We have found that telemedicine and its applications are getting more attention by public and private granting organizations.” Greater attention will mean more funding opportunities for telemedicine programs. He also said, “This attention will continue to grow as we find more ways to use telemedicine equipment to solve public issues like access to health care in rural or urban underserved populations.” Many program managers reported that telemedicine is an emerging opportunity for granting agencies and the opportunities to seek funding for new and expanding programs are plentiful.

The cost of purchasing telemedicine equipment has been coming down in recent years. One program manager stated, “Just like the drop in the price of consumer electronics, televideo cameras have gotten a lot better at much lower cost.” Another manager said, “The cost of telemed technology will continue to become more affordable, practical, and easier to use in the next few years.” This reduction in equipment cost will significantly reduce the barriers associated with cost and efficiency by lowering the financial threshold necessary to fund equipment and be profitable.
Finding new ways to partner and share cost with rural hospitals and physicians can help reduce the total expense of a telemedicine program. As one rural program manager described it:

*Most of our remote systems are installed in the local hospitals because the line charges can be less in the hospital. Many rural hospitals are also paid on a cost basis by Medicare or are frequently more willing to underwrite some of the cost as a benefit to the community.*

Rural hospitals have access to federal programs to help pay for communication lines to rural communities. Most small rural hospitals are federally designated as Critical Access Hospitals, a federal designation specific to small rural hospitals that qualifies them for actual cost based reimbursement from Medicare. Because telemedicine equipment and communications would be considered part of the cost of providing care in the rural community, the hospital would receive additional payment from Medicare for the additional cost of the service. These are examples of two extra payment sources not available to urban hospitals or physicians.

This partnership to help reduce cost can also be seen on the urban side of the telemedicine system. One urban program manager described using the urban medical center resources to help pay for telemedicine equipment. He said, “We have given out telemedicine stipends to rural hospitals and clinics based upon their usage. It helps pay for their line charges.” This strategy serves as a financial subsidy to the rural health care providers for participation in the program. In this case the urban medical center is contributing financially to the rural program as a means of supporting an unmet need in
the rural community and attempting to direct referrals to the urban medical center’s programs or services.

The financial success of a telemedicine program is also dependent upon its ability to correctly code, bill, and collect for the telemedicine encounter. Key informants provided very few ideas for overcoming some of the coding and billing barriers to adopting telemedicine. One urban based program manager suggests trying to provide coding and billing assistance from the urban medical center as a means of helping rural physicians overcome this barrier. He said, “We provide all the billing and coding for the physicians. We maximize the billing according to what’s required and help them improve their revenues.” This assistance helps rural physicians generate the revenues necessary to cover the cost of the telemedicine service and produce profits comparable to face-to-face patient encounters.

While almost half of the key informants identified reimbursement as a significant barrier to adoption of telemedicine, few could provide suggestions for overcoming this barrier. One suggestion is to increase the amount of time spent lobbying and working with health care insurance companies to advocate for better telemedicine reimbursement. One program manager said, “We are working with our state hospital association to change Medicaid legislation to help pay for telemedicine encounters.” Another manager responded, “We are trying to get the medical directors from the commercial insurance companies to see a live demonstration of telemedicine in our clinics. So many people just don’t understand the benefits of telemedicine until they see it first hand.” Their hope is that the medical directors of insurance companies will see the value telemedicine can bring to patient care and help convince their company to pay for telemedicine visits.
One of the urban program managers described a program to help improve the reimbursement of physicians and overcome this barrier. This hospital contracts with physicians for blocks of time to stabilize reimbursement. The manager described this program as follows:

*We worked with the rural communities to contract for blocks of a physician’s time. We started contracting for psychiatry and endocrinology. This way the specialist physician was not at risk for productivity or patients that didn’t show up for telemedicine appointments. The rural hospitals were then responsible for filling the contracted time slots with these physicians and were at risk for loss of productivity. This made them more responsible to schedule patients and help patients keep appointments.*

Contracting for a block of physician time is one means of guaranteeing the availability of a physician specialist to provide consults for rural patients without the physician accepting any risk for unproductively or non-reimbursement. It also forces the rural hospital or clinic to work to maximize the productivity of the contracted physician because they are paying for the specialist’s time.

*Physician Engagement*

The third most frequently mentioned theme for barriers to the adoption of telemedicine is the lack of physician engagement. Categories clustered around this major theme include resistance to change, lack of a defined need, lack of physician leadership, loss of the face-to-face physician-patient encounter, the fear of losing patients by the
rural physicians, the absence of standards for the use of telemedicine, and credentialing and licensure issues across state lines.

One suggestion for overcoming physician resistance to change includes getting physicians engaged in planning the telemedicine service. Several key informants report that involving physicians in the planning stages of a new telemedicine venture helped them overcome their resistance. One manager suggested, “We need to engage physicians in the planning for telemedicine. Talk to the physicians openly about the use of the equipment, ask them what they would like to see, and get them involved in the process.” Involving the physicians in planning for the telemedicine services gives them more ownership in the development of a telemedicine service and increases the probability that they will feel more committed to the program’s success. Engaging physicians in the planning of new and developing telemedicine programs was a consistent theme in this study. It helps to develop a connection with the project and build ownership in the development of the telemedicine project.

Additionally one physician suggested the value of direct clinical experience with the telemedicine equipment as a means of overcoming physician resistance. He described his experience by saying, “We find that it’s just like convincing a physician to adopt a new protocol or prescribe a new medication. We just get them to think of telemedicine as prescribing a new drug and encourage them to try it.” Getting physicians to experience the technology and make sure it meets their clinical needs is vitally important. Simply putting on demonstrations is not seen as enough. He went on to say, “Clinicians must participate in a patient encounter. Having a believer sounds good but physicians don’t really pay attention until they experience it for themselves.” This same
notion was also suggested by a rural physician who said, “Don’t assume that a physician
won’t be interested before he has an opportunity to see and try the technology first hand.
You may be surprised.” A hands-on experience with telemedicine is seen as a best
practice for overcoming a physician’s reluctance to use telemedicine due to unfamiliarity.

Finally, two key informants suggested that the best way to overcome a
physician’s resistance to try telemedicine is to be very persistent in the pursuit of the
physician. One program manager said, “Persistence is our secret to overcoming
physician resistance to try telemedicine. We have been doing this since 1993 and it’s
only been in the last couple of years that we have seen a significant rise in use.” Giving
physicians time to become accustomed to the idea of using telemedicine in their clinical
practice is a best practice for overcoming resistance to using telemedicine.

The ability to get a physician to identify with a defined need to use telemedicine
is seen as a best practice for engaging physicians in its use. One physician leader stated,
“Time must be spent to define the need for the telemedicine program up front. There
should be a clear expectation of how to utilize the tool before the tool is even given to the
physician.” Another program manager said, “The successful telemedicine programs are
ones that are developed to address real needs.” Key informants suggest that defining the
need for the program should not be left to chance. One successful program manager said,
“You need to be able to present a complete package to the physician and emphasize that
it will be worth his time, fulfill a huge need, and has the opportunity to increase referrals
and generate revenue.” Leaving it up to the physician to develop a successful business
model for the use of telemedicine was described as an invitation to failure. He went on to
say, “You need to walk into the physician’s office with a good model the he can
A practical demonstration of a successful model for the use of telemedicine was described as extremely effective in overcoming physician resistance to adoption.

Once a definitive need is established for the use of telemedicine, the importance of physician leadership becomes paramount and this component of the program cannot be over-emphasized. Many key informants identify establishing physician champions on both the urban and rural side of a telemedicine program as a best practice for success.

One urban physician leader described this as follows:

_We started with a very strong medical director for the telemedicine program. He had a lot of political influence with the medical staff and with our health system that helped us to show that we had a strong footing within the health system. We approached friends of our medical director first and took advantage of the influence he had. It's all about the relationships with the physicians. A physician champion is an absolute must for success._

A rural physician informant agreed that a physician champion is necessary to support the vision and keep up momentum. He said, “There has got to be a rural champion. Somebody on the rural side who says, ‘This is really important. Let’s keep on doing it.’ and somebody who has great credibility with physicians.” When asked if a telemedicine champion had to be a physician many key informants suggested that it was important that physicians talk to physicians for the best relation on the topic. As one physician leader described it, “You must have nurses talking to nurses and physicians talking to physicians.”

In addition to a physician champion’s role in influencing other physicians, many key informants also placed importance on their having influence with hospital and health
system administration. One program manager said, “The value of good administrative support for the program cannot be over emphasized. The physician champion must have the endorsement of administration to be able to say that this is the way we do business in this organization.” Telemedicine must be seen as a part of the culture of the organization. Like it or not, the support of administration is vital to the success of any telemedicine program. Administrators hold the key to the resources necessary to help make a program successful.

The loss of a face-to-face physician-patient encounter is mentioned by some key informants as a barrier to physician adoption of telemedicine. Best practice for overcoming this barrier is to help physicians learn how to improve their interpersonal communications skills and giving them the opportunity to experience the televideo physician-patient interaction first hand.

One successful telemedicine program manager prefers to refer to the communication between physician and patient as interpersonal communications and suggests that getting over the lack of a face-to-face encounter with a patient is facilitated by teaching good interpersonal communications skills. He suggests, “We need to learn the basics of what good communication is and what is good active listening and adopt these skills to the televideo environment.”

Other program managers suggest that giving the physician an actual experience with a live televideo patient visit helps to dispel this perceived barrier. One program manager describes this method as follows:

Some physicians think that they can’t bond with their patient or they can’t see or hear well enough with televideo to get the information they need. We offer to
pilot test the system with one of their own patients. The minute they actually see it in action they find out that it will work. It takes a test drive of the system to really show them the benefits of telemedicine.

It is important to note that this suggestion is not just to use the video equipment for educational purposes but to actually see telemedicine in action with one of their own patients. It was described as the difference between seeing a car commercial on television and actually taking a personal test drive.

Key informants report that a rural physician’s lack of understanding and fear of losing patients to urban specialist physicians was also a barrier to adoption of telemedicine. These informants suggest that this fear can be overcome by talking through the issue and choosing specialist physicians carefully. One urban program manager described talking through the issue when he said, “You have to get over the perceptions that the tertiary centers or universities don’t understand the realities of the rural environment. We are not here to tell you how to run your hospital, steal your business, or steal your patients.” An urban specialist physicians’ role is to assist rural practitioners in providing patient care through the use of telemedicine technology. He also said, “We want to work with you. We want to maintain the traditional referral patterns you have already established.” Many urban specialist physicians provide the same basic services as their rural colleagues. Failure to refer patients back to their rural primary care physician for these services can disrupt the relationship between rural and urban physicians and act as a barrier to the use of telemedicine. Key informants also describe the importance of carefully selecting physicians to use the telemedicine system. An urban physician medical director said, “We choose our specialty physicians very
carefully. They need to be known within their department as being high quality doctors and diplomatic when talking to referring physicians.” Urban medical centers are beginning to understand the importance of marketing and good customer service. The rural communities, hospitals, and physicians are customers of the urban telemedicine service and as the technology becomes more available in the rural communities, the smarter telemedicine services recognize that rural physicians will have a choice and will prefer to work with the more accommodating and customer-friendly telemedicine services.

Successful telemedicine program managers advise emphasizing the educational uses of the televideo system as a means of overcoming the barrier of physician engagement. One urban program manager explains, “When a patient is scheduled with a specialist to review something that the rural doc is interested in or has never seen before, we encourage the rural physician to sit in on the telemedicine consult in order to learn about the disease and treatment options.” The rural physician can experience a personal benefit by using the telemedicine equipment to advance his own knowledge and then becomes an advocate for using the system. Rural physicians report a significant degree of professional isolation associated with practicing in a rural community. Telemedicine can be used as a means of connecting rural physicians to educational opportunities with their urban colleagues. It can also serve to overcome the isolation of a rural practice and as a means of gaining their support for the use of telemedicine.

Finally, several key informants describe the way an open network, one that allows any site to connect to any other site, can help rural physicians overcome this barrier and feel more comfortable with the use of telemedicine. An open network provides
completely open access to any other telemedicine service in the region and eliminates barriers to communication among physicians, hospitals, and health care systems. One state-wide telemedicine program manager describes an open network as, “The more open your telemedicine network the more accepted it will be in rural communities.” An open network allows rural physicians to work with already established referral relationships and send patients electronically to the same specialists they normally do. She also said, “They don’t feel like the system is forcing them to change established referral patterns and send their patients to one program.” Finding new ways of connecting telemedicine networks by building bridges between private communications systems or using the Internet is seen as a significant opportunity to eliminate this barrier.

Technology

Key informants identified best practices for helping physicians overcome technical barriers to the adoption of telemedicine. These suggestions relate to helping make the technology more user friendly, of higher quality, and providing close technical support. To make the telemedicine equipment more user friendly one program manager reports providing the physicians with free access to the Internet. He said, “We provide free broadband access for the doctors as a means of helping them get access to online resources.” This access provides opportunity for the physicians to become more familiar with the technology by using it for educational and research purposes. Another program manager described how he is making the equipment more user friendly:

*We converted our telemed systems from dedicated lines to the Internet and that allowed us to put video conferencing on the desktop computer in the doctor’s*
These docs just shut their office door and made their telemed appointments from their offices. It really made it much more convenient to use than having to go down the hall to a special exam room or equipment room.

Modern physicians use the Internet for access to information on a daily basis. They expect the same ease of use from their telemedicine system.

The quality of telemedicine equipment must also improve before many physicians will feel comfortable using it for patient visits. The telemedicine industry is on the brink of a completely new generation of televideo capability. Just as the consumer electronics world is changing to high definition television, telemedicine equipment is also moving into the world of high definition. To improve the quality of the telemedicine equipment one program manager suggested converting telemedicine equipment to high definition. High definition equipment provides a much clearer image at both ends of the technology and overcomes some of the perceptions of poor image quality. He described the difference by saying, “The image quality, audio, and echo problems all went away. If you have only seen the older quality equipment then there are probably some misconceptions about what a video conference can look like.” This movement to high definition cameras and video monitors has the potential to completely revolutionize the world of telemedicine. The order of magnitude improvement in video image quality is amazing and will make a significant difference in the perceived technical quality barriers of physicians.

The final suggestion for overcoming technical barriers to using telemedicine is to provide personnel with adequate training and experience to support the telemedicine equipment and keep it functioning. As one program manager explains, “You need to
have the technical people, equipment, and broadband all functioning at an acceptable level or the doc will just get up and walk away.” The informants' main suggestion for overcoming this barrier is to pay close attention to the need for technical support resources to ensure the critical support staff remain in the budget for the program. Not providing an appropriate level of technical support for the telemedicine system is considered one of the worst mistakes program managers can make. On a reassuring note, one program manager said, “This issue becomes less important over time as we progress because the technology just gets better and better and becomes more off-the-shelf and reliable.” Successful programs emphasize the importance of finding and keeping great technical help to support the quality and reliability of their programs.

Understanding

The last theme explored as a barrier to the adoption of telemedicine is the lack of knowledge and understanding about what telemedicine is and how it is used. Suggestions for overcoming this barrier include setting reasonable expectations for how telemedicine is used, providing physicians with the opportunity to try it, integrating telemedicine into medical education, allowing enough time for physicians to get accustomed to using it, and actively promoting it.

First and foremost, key informants emphasize the importance of setting reasonable expectations for how telemedicine should be used. This was best described by one urban program director, “Physicians need to understand that they won’t be able to do everything they can in the office. Make sure that the clinicians fully understand the
limitations of the technology in advance.” Unrealistic expectations create opportunities for disappointment and failure.

The next suggestion is to ensure physicians have an opportunity to see the technology in action and try it themselves. One physician asserts, “The more physicians see visible successes with the technology the more they will become familiar with it and use it. We have found that if you can get the physician to try it for 12 times in their office they will be sold on the technology and use it.” Several key informants report setting up the telemedicine equipment in a physician’s office and letting them try it at their leisure as often as they wish. These trials can be for educational events, business meetings, or personal visits. A direct correlation was reported between using the equipment and the reduction of barriers to its adoption for patient encounters.

Key informants suggest that the best way to increase physician understanding and use of telemedicine technology is to incorporate it into their medical education. One of the physician medical directors said, “Telemedicine technology has to be integrated into the basic education of all physicians. A lot of physician understanding and relationship with technology starts with education.” He also described how his medical school has incorporated 50 hours of telemedicine educational programming into their curriculum. Understanding and using telemedicine in the practice of medicine may take a generational change in how physicians are trained but is a promising best practice.

Some of the final words of advice for overcoming the lack of understanding are to actively promote it and to give it adequate time to develop. Two key informants describe their efforts at selling telemedicine to physicians. One urban program manager explains that, “We have a marketing team that goes into the rural areas and teaches the local
doctors how to use the equipment.” Another said, “We took the equipment out and had dinner meetings where the physicians could use it and train on it before they needed to actually use it in a clinical setting.”

Finally, one program manager simply states, “Sometimes it just takes time to work out all the issues and build understanding. After all, Rome wasn’t built in a day.” Several successful program managers echo the need for time, and one sums it up most succinctly by saying, “Sometimes timing is everything. There is no substitute for the right program meeting the right need at the right time with the right people to help make it successful.”
Research Question Three: Knowing what you know now, what words of wisdom might you share with other providers who are considering adopting telemedicine in their practices?

The great majority of key informants provided a response to this question by simply repeating their suggestions for overcoming the barriers to adoption of telemedicine. A review of the frequency in mentioning key words and phrases also failed to contribute to the body of knowledge on this subject. Applying a filter to remove key words, phrases, and categories previously mentioned in response to the second research question resulted in the identification of new categories and emerging themes.

Once the filter removed concepts previously presented, the remaining data was coded by key words and phrases and categorized revealing three major themes. The themes for answering the research question about words of wisdom for new telemedicine programs included: finding the right people to help a new program get started, making sure that the program starts with a sound business plan, and not taking on more work than the program can accommodate.

Find Help

Identifying the right people to help the new program get started is essential to ensuring its success. Suggestions related to this theme include contacting the new Telehealth Resource Centers for help, engaging new physicians before they get too busy, capitalizing on a physicians natural interest in technology, looking for synergies among
physicians who already use telemedicine technology, and taking the time to visit successful telemedicine programs.

One key informant currently works for a regional Telehealth Resource Center. These resource centers are established regionally throughout the country with grants from the Office for the Advancement of Telehealth in the Department of Health and Human Services. The stated purpose of these centers is to help new and emerging telemedicine programs be successful. He reports, “The new Telehealth Resource Centers are established to help new and developing telemedicine programs find the information they need and help them be successful.” The Telehealth Resource Centers are available to assist telemedicine programs by helping them find grant funding, evaluate telemedicine programs, and helping advance new telemedicine public policy.

Two telemedicine program managers suggest that a key to building a new telemedicine program is to “find physicians who are new to the community before they get too busy to want to try something new.” The ideal time to find a highly motivated physician is to identify a new physician moving to town and engage him or her while they are actively finding ways to build a practice.

A parallel to this suggestion is finding physicians who have a natural interest in the technology. Young physicians with a passion for technology and its integration into the practice of medicine make perfect targets for inclusion. One physician leader stated, “We find that some physicians are attracted to telemedicine because they have a natural or research interest in the use of technology in the practice of medicine.” This natural interest in technology can be cultivated. He also said, “Some of our biggest users of
telemedicine have active research projects going on the topic.” Identifying physicians with a research or natural interest in the use of technology is identified as a best practice.

Several key informants suggest taking the time to travel to a successful telemedicine program and see first hand how the program operates will be helpful to new and emerging programs. One program manager said, “Don’t reinvent the wheel. Everyone will do it a little differently at first but there are going to be many things in common. Don’t underestimate the value of being able to touch and feel the technology in action.” Several program managers reported that visiting another telemedicine program to learn from their experience made a significant difference in the success of their own program.

Develop a Business Plan

Those who want to initiate telemedicine should ensure that they produce a viable business plan. Many telemedicine program managers describe their own difficult beginnings and credit the development of a good business plan for their ability to survive. One physician leader described his experience by saying, “Be thoughtful about the cost of implementation and the offset that you will get by increased revenue or it may be based on the non-monetary issues like improving the quality of care provided and the health of your patients.” He cautioned new programs by saying, “People get enthusiastic about telehealth and tend to overestimate the value and volume. You need to be realistic about its value to your patients, organization, and your strategic direction.” The value of the program must be demonstrated in a good business plan before the necessary approvals can be obtained. Other suggestions relative to a good business plan include securing grant funding to help a new program get started, budgeting for the replacement of the
technology and marketing to physicians and patients, and including any revenue associated with improved physician productivity and increases in hospital ancillary revenue in the plan. One last word of wisdom from a successful telemedicine program manager is, “Make sure your program can be self-sustaining in the long-run and be sure your plan has an exit strategy if it doesn’t work.”

Start Small

The last theme identified from the responses to suggestions for ensuring success is to understand that a new program does not attempt to accomplish more than it can successfully handle. One rural program manager is quoted as saying, “One of the challenges we face is that potentially you create demand and as you develop your relationships through telemedicine you need to be sure that the demand you create can be met.” Another program manager suggests, “Start small, one service at a time, and create your successes. Start with one program; work out the bugs, and then go on to the next program, and then the next.” While every telemedicine program manager wants to be successful, adopting a development plan that is too aggressive or ambitious may actually serve as a deterrent.

Other suggestions for this theme include instituting telemedicine by initiating non-competitive services, those that bring new services to the rural community that would not be possible without the technology, and looking for rural-to-rural opportunities for growth. Anything considered to be duplicative of the existing local services will be considered competitive and distrusted by the local medical staff.
Limitations of the Study

This study is limited to reports of physician barriers to the adoption of telemedicine and best practices for overcoming these barriers by successful telemedicine program managers and physicians. The study is further limited by the fact that only successful telemedicine program managers and physicians were interviewed and there are a limited number of physician interviews. The study was also limited to successful telemedicine programs within the continental U.S.

Need for Future Research

Opportunities for future research should include studies to identify non-physician providers and patient barriers to the adoption of telemedicine. Quantitative measures of physician use and satisfaction with telemedicine services before and after the implementation of strategies to overcome physician barriers should be considered for future study. Studies should also be conducted to analyze the rate of adoption of telemedicine based upon the impact of strategies to overcome physician barriers.

Finally, the interviewees themselves suggested that there is a need to complete more clinical outcomes research to quantify the impact of telemedicine on access to care, clinical quality, outcomes, and the cost of health care.
CHAPTER V: DISCUSSION

This chapter discusses the study findings in context with the review of the literature to find new understanding that contributes to the body of knowledge about physician barriers to the adoption of telemedicine. This discussion will review the differences between the review of the literature and the research findings, discuss the implications of new information emerging from the research, identify areas for further study, and conclude with a summary of the importance of the knowledge gained. The researcher compared and contrasted the information contained in the review of the literature with information obtained in the study to find new meaning and understanding. Table 3 lists the barriers found in the literature review and compares them to barriers identified in the study.

Table 3: Comparison of identified barriers to the adoption of telemedicine between the review of the literature and research study.

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<th>BARRIERS CONTAINED IN THE LITERATURE</th>
<th>BARRIERS IDENTIFIED IN THE STUDY</th>
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<td>2 Lack of a definitive need</td>
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<td>13</td>
<td>Inefficient use of a physician's time</td>
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<td>14</td>
<td>Rural physicians' fear of losing patients to urban specialists</td>
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<td>15</td>
<td>The absence of standards of practice for the use of telemedicine</td>
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<td>16</td>
<td>Lack of connectivity between telemedicine programs</td>
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All of the barriers found in the review of the literature also emerged from the current study along with four new barriers. These newly identified barriers include inefficient use of physician's time, rural physicians' fear of losing patients to urban specialists, the absence of standards of practice for the use of telemedicine, and lack of connectivity between telemedicine programs.

**Efficiency**

The most frequently identified theme in this study involved barriers related to the concept of efficiency. Key informants identified the inefficient use of a physician's time as a barrier to the adoption of telemedicine. They described the concept of inefficiency in relation to the ease of access to telemedicine equipment, the speed and reliability of the
equipment, and the length of time it takes to complete a telemedicine patient visit. If the physician perceives that it takes more time to complete a telemedicine visit than a face-to-face visit then s/he will consider telemedicine an inefficient use of time and avoid the technology. Key informants identified the need to make telemedicine more efficient in the eyes of physicians in order to secure their cooperation and overcome the barrier of inefficiency. Participants in the study fully recognize that physicians are busy and anything that would deter them from an efficient clinic operation would decrease their willingness to cooperate.

The researcher believes that the concept of time and inefficiency is an important barrier because of the anticipated growth in the demand for health care services and the impending shortage of physicians. Keeping up with the future demand for health care will put significant pressure on the health care system to be more efficient and productive with physicians’ limited time. The days of making physicians come to the hospital or even to separately locate a telemedicine suite in the same building are over. Overcoming the barrier of inefficiency will require incorporating new ways of integrating telemedicine into the workflow of the physicians practice.

New ideas emerged from the study about how to make telemedicine as seamless as possible for physicians when they see patients electronically. These new ideas included the placement of telemedicine equipment into the physician’s clinic environment. Telemedicine systems built into physicians’ exam rooms and incorporated into their desktop computers will need to become the norm. New procedures and processes will need to be adopted that speed the preparation, presentation, and processing of telemedicine patients in order to improve efficiency.
Competition

Telemedicine program managers and physicians alike described the fear of losing patients to urban specialist physicians as a barrier to physician adoption of telemedicine. This fear was aggravated by the fact that one of the stated purposes of telemedicine is to facilitate access to urban specialist physicians for rural patients. This improved access makes it easier for rural patients to get to know and use urban specialist physicians. With improved access and familiarity also comes the potential that rural patients would prefer a telemedicine visit with an urban physician over face-to-face encounter with a rural physician, thus creating the perception of competition. This preference for an urban specialist physician may also increase their tendency to travel to the urban physician for direct patient care. Rural physicians should be included in planning for new telemedicine services so their input is used in selecting urban physicians to participate in the program. Urban physicians should also be cautioned about respecting the traditional referral patterns of rural physicians. Care must be taken in selecting urban specialist physicians, training them to be mindful of this barrier, and to design their patient interactions so as to be supportive of their rural colleagues’ relationships with their own patients.

Absence of Standards

The absence of standards of practice for the use of telemedicine was identified as a new barrier to the adoption of telemedicine. This barrier was described as based in the physicians desire to have established protocols, procedures, and standards of practice for the use of any new technology before incorporating it into their clinical practice. Many rural physicians prefer to use well established medical procedures, treatments, and technology. They leave most of the research and innovation to urban and academic
medical centers. This absence of well documented and tested standards of practice creates a barrier in the minds of some rural physicians. Successful telemedicine program managers and physicians reported working on the development of standardized procedures for its use and research associated with identifying practice standards that yield better clinical outcomes.

_Open Connectivity_

Key informants identified the lack of connectivity between telemedicine networks and providers as a barrier to the adoption of telemedicine. This barrier was identified by rural program managers and physicians more frequently than their urban counterparts. Rural physicians would prefer to keep an open access to all of the available telemedicine programs, services, and specialist physicians. Rural physicians would like to be able to communicate via interactive video with any other physician as easily as they do by using a telephone. With a telephone the physician simple picks up the receiver, dials a number, and any physician specialist can be available to consult with them and their patients. The lack of open access in some telemedicine networks occurs because many of these networks use public communication lines and the Internet to facilitate data transmission. They have adopted very strict access protocols and firewalls to protect the privacy and confidentiality of patient information transmitted electronically. This increased level of security can act as a barrier to physician communications by prohibiting free and open communication between telemedicine networks and physicians.
New Information

It is significant to note that the newly identified physician barriers to the adoption of telemedicine can all be associated with physicians who are already using telemedicine. The newly identified barriers include efficiency, fear of losing patients to urban specialist physicians, absent standards of practice, and lack of open connectivity between telemedicine programs. The researcher believes that these newly identified barriers represent a significant evolution in the adoption and use of telemedicine. Key informants spent significantly less time describing the barriers associated with getting a physician to try the technology and more time identifying barriers associated with continued or increased use of telemedicine. It will be important for successful telemedicine program managers and physicians to recognize the fact that getting physicians to try telemedicine is only the first barrier and that new barriers will emerge after initial adoption.

It was evident that all of the barriers identified in the literature review were also contained in the current study. However, the context of some of these barriers was different in this study than in the pre-existing literature. The researcher found three examples of contextual change in barriers within the study. They are identified as the quality of telemedicine equipment, value, and physician understanding and knowledge.

The literature makes reference to the poor quality of telemedicine equipment as a barrier to physician adoption of the technology (Allen, Hayes, Sadasivan, Williamson, & Wittman, 1995; Mitchell, Mitchell, & Disney, 1996; Mairinger, Gabl, Derwan, Mikuz, & Ferrer-Roca, 1996; Gschwendtner, Netzer, Mairinger, & Mairinger, 1997; Mairinger, Netzer, Schoner, & Gschwendtner, 1998). This poor quality is mostly described in terms of the unreliability of the equipment. The current study adds a new dimension to this
barrier because key informants tend to focus less on the reliability of the equipment and more on the actual quality of the video image. In this study key informants report on the frustration of physicians who can not focus on a satisfactory image of the patient during a consultation. The researcher believes this is significant because the previously identified barrier of equipment reliability appears less frequently. There was little or no mention about audio quality or the quality of images derived from X-rays or captured by high resolution still cameras. This appears to be primarily described as a factor of the resolution of the video image and has implications for new or emerging telemedicine programs in terms of the quality of video cameras and monitors they use. Several key informants reported converting their video camera and monitoring systems to the new high-definition formant. This format was associated with a significant improvement in physician satisfaction with video image quality.

The lack of reimbursement was identified in the review of the literature and in this study as a significant barrier to physician adoption of telemedicine (Whitten & Buis, 2005). Key informants in this study focused less on the amount of reimbursement and more on the concept of value. Value is a term that implies an acceptable benefit for the cost incurred. This cost can be quantified in either financial resources or time expended. The benefits derived from the use of telemedicine must exceed the relative investment of time and money to produce the perception of value. This is a significant new dimension to this barrier. As payment for telemedicine continues to improve and the percentage of paid telemedicine visits increases, physicians and program managers are shifting their attention toward the concept of value. This new focus on value arises from the program managers’ desire to see reimbursement exceed their investment in time, equipment,
training, and operating cost. Telemedicine physicians also want to see a return on the programs financial investment but more frequently describe this barrier in terms of wanting to use their time more efficiently. They would also like to realize a financial return on their professional practice time equal to or better than time spent seeing patients on a face-to-face basis.

The review of the literature identified physicians’ lack of understanding and knowledge about the technical details of how telemedicine works used as barriers to the adoption of telemedicine (Yellowlees, 2005; Alverson et al., 2004; Shannon et al., 2002; Hopp et al., 2006). Participants in this study still identified a lack of knowledge and understanding of technical issues as a barrier but more frequently describe this barrier in a broader context. In this context they describe the barrier as a lack of understanding about the value of telemedicine to the physician in expanding access to care, improving quality, and improving clinical outcomes for patients. The researcher believes this is also a significant implication in the new findings because the physicians’ knowledge barrier appears to be expanding from simply understanding how the technology works to a more in-depth understanding about how it can be used to actually improve the practice of medicine.

Areas for Further Study

Overcoming physician barriers to the adoption of telemedicine will be vital to the future in fulfilling the demands for health care in rural communities. Further study should include; development of standards of practice for the use of telemedicine; a comparative analysis of physician satisfaction; quantifying the impact of changes made in overcoming
barriers to the adoption of telemedicine; and research on the outcomes to quantify the clinical impact of the use of telemedicine.

One of the newly identified barriers to physician adoption of telemedicine was the absence of standards of practice for the use of telemedicine. Further study should be done to help develop standards of practice. These standards should analyze and report how telemedicine can best be used to improve patient care and the management of disease. Additional research would be helpful in identifying which diseases can be managed remotely by telemedicine, what diagnostics can be adapted to the remote environment, and what treatment and disease management protocols work well with telemedicine.

While the literature contains studies about physician and patient satisfaction with the telemedicine experience, future studies should include an analysis of changes in satisfaction before and after the implementation of specific strategies to overcome physician barriers (Krousel-Wood et al., 2001; Whitten & Mackert, 2005). As an example, much has been written about incorporating changes in the location of the telemedicine equipment to improve efficiency and better integrate telemedicine equipment into the normal clinic practice. Physician and patient satisfaction studies could be performed before and after implementation of changes in the delivery of telemedicine to determine if they are effective at improving satisfaction measures.

Further study should be done to quantify the impact of changes made to improve efficiency. Studies could be designed to measure the number and length of telemedicine encounters before and after adopting strategies to improve efficiency. Quantitative studies should also be developed to measure the financial performance of telemedicine.
operations and changes made to improve the physician’s perception of value. These data could prove valuable in demonstrating the value of telemedicine to physicians in hopes of improving their rate of adoption.

Finally, there is a need for more extensive clinical outcomes research to measure the impact of using telemedicine. Studies should be designed to measure the impact of telemedicine on quality, cost, emergency room use, and the rate of hospitalization. Outcomes data that demonstrate the positive effects of telemedicine in improving clinical outcomes, disease management, and the reduction of cost to the health care system could also prove valuable in convincing physicians to adopt the technology.

Conclusion

In conclusion, this study contributes to the body of knowledge by exploring what is known about physician barriers to the adoption of telemedicine, identifying new barriers to the adoption of telemedicine, providing insight into best practices for overcoming barriers, sharing words of wisdom from successful telemedicine program managers and physicians, and discussing the implications of the research in helping overcome physician barriers to adoption of telemedicine.

The results of this study should be valuable to program managers and physicians working with new and developing telemedicine programs that need to identify and overcome physician-perceived barriers to adoption of telemedicine into the clinical practice of medicine. Overcoming these barriers and increasing the use of telemedicine will help provide access to physicians for patients living in rural communities. The results of this study will be used by the researcher to identify and develop strategies for successful implementation of telemedicine programs. It will also provide the basis of
presentation at the 2008 American Telemedicine Association annual meeting and an article submitted for publication to the *Journal of Telemedicine and e-Health*, the official journal of the American Telemedicine Association.

There is a perfect storm brewing in rural America. This storm is born from the collision of competing pressure fronts. The increasing pressure is created by a growing demand for health care services combined with a declining number of physicians to provide care to rural patients. We can see the storm building on the horizon and it will soon be here. Health care providers can deny the coming storm, seek shelter, and hope to ride it out. Unfortunately, our rural friends and neighbors will likely be hurt in the process. The future of health care for rural communities will depend upon our ability to find new ways to provide access to physicians and to keep services within our local communities. Rural and urban physicians alike and the leadership of our health care organizations need to focus more attention on overcoming the remaining barriers to physician adoption of telemedicine. Focusing on ways to improve the efficiency and flow of patients in a physicians’ practice, demonstrating the value or return on investment, improving the quality of video imagery, and increasing our understanding about how telemedicine can improve access to health care, quality, outcomes, and disease management will all be essential for the future. The time for leadership is now because the future of rural health care is in our hands.
REFERENCES


101


APPENDIX A: INTERVIEW QUESTIONS

1. To what degree do you use telemedicine technology in interacting with your patients?

2. To what degree are you satisfied with the use of telemedicine technology as a means of communication with patients?

3. What do you perceive were the barriers to adopting telemedicine into a medical practice?

4. How did you overcome these barriers?

5. What factors contributed to or facilitated your decision to adopt telemedicine technology into your practice?

6. Knowing what you know now, what words of wisdom might you share with other providers who are considering adopting telemedicine in their practices?

7. Given what you now know about the preceding questions, who else would you recommend we include in this interview process?
APPENDIX B: INTERVIEW GUIDE

1. Begin the discussion by getting acquainted with the participant; explain the purpose of the study and its importance to the future adoption of telemedicine by physicians.

2. Explain the format of the interview and emphasize that in addition to the prepared questions, the researcher is definitely interested in anything else the participant considers important to the subject of the interview.

3. Ask for permission to audio record the interview. Assure the participant that all responses will be strictly confidential and any information used in the final report will be summarized to protect the identity of all participants.

4. Reiterate that the participant will receive a written summary of the interview and be given the opportunity to make any changes or corrections to the summary.

5. Explain to the informant that the results of this study may be used for secondary data analysis, publication, and/or presentation at state and/or national professional association meetings and conferences.

6. Tell the participant that every opportunity will be made to respect his/her time and end the interview on time.

7. Questions:
   1) To what degree do you use telemedicine technology in interacting with your patients?
   2) To what degree are you satisfied with the use of telemedicine technology as a means of communication with patients?
3) What do you perceive were the barriers to adopting telemedicine into a medical practice?

4) How did you overcome these barriers?

5) What factors contributed to or facilitated your decision to adopt telemedicine technology into your practice?

6) Knowing what you know now, what words of wisdom might you share with other providers who are considering adopting telemedicine in their practices?

7) Given what you now know about the preceding questions, who else would you recommend we include in this interview process?
APPENDIX C: SAMPLE PRE-INTERVIEW LETTER

Dear (Key informant’s name):

First let me thank you for agreeing to participate in the telemedicine facilitation study. As I mentioned to you on the phone, this study is designed to identify the barriers and facilitators to adopting telemedicine into the clinical practice of medicine. The study is designed to illuminate those issues which act as barriers to the adoption of telemedicine and identify those actions or conditions which serve to facilitate the use of telemedicine in the practice of medicine. Our hope is that this study will help other identify barriers to implementation and best practice in successfully adopting telemedicine. We are excited about the potential this study holds for the future of telemedicine and appreciate your willingness to share your insight and experience.

As we discussed on the phone, by participating in this study you are agreeing to allow me to interview you for a period of time not to exceed forty-five minutes to an hour. I will record and transcribe our interview to assure better accuracy of the results and to allow me to properly code the major themes in our discussion for reference with other interviews. Your interview will be completely confidential. All recordings, summaries, coding sheets, and notes will be numerically coded to protect the identity of all participants in the study. After our interview I will prepare and mail you a written summary of our interview identifying key points and major themes. This summary will provide you with the opportunity to validate or correct my interpretation of the interview.
Attached, please find a copy of the questions to be used during our interview. Providing these questions in advance will provide you with the opportunity to think about and prepare your response to each question. Thank you again for agreeing to participate in this study and I look forward to the opportunity to talk to you further about telemedicine.

Sincerely,

Larry E. Leaming
Principle Investigator

P.C. Interview questions
Dear (Key informant’s name):

Thank you for participating in the telemedicine facilitation study. As I mentioned during our interview, this study is designed to identify the barriers and facilitators to adopting telemedicine into the clinical practice of medicine. The study is designed to illuminate those issues which act as barriers to the adoption of telemedicine and identify those actions or conditions which serve to facilitate the use of telemedicine in the practice of medicine. Our hope is that this study will help other identify barriers to implementation and best practice in successfully adopting telemedicine. We are excited about the potential this study holds for the future of telemedicine and appreciate your willingness to share your insight and experience.

As we discussed on the phone, your interview is completely confidential. All recordings, summaries, coding sheets, and notes will be numerically coded to protect the identity of participants in the study. Enclosed, please find a written summary of our interview identifying key points and major themes. This summary will provide you with the opportunity to validate or correct my interpretation of the interview and add any additional information that you think is pertinent to the study. If you would please, provide me with an acknowledgement of your receipt of this summary and any corrections or additions you may have. Your validation of the content of this summary is extremely important to the study.
Thank you again for agreeing to participate in this study. This information will be extremely important in helping new and developing telemedicine programs understand the physician barriers to adoption of telemedicine and your best practices for overcoming these barriers.

Sincerely,

Larry E. Leaming
Principal Investigator

P.C. Interview summary