

**VIRTUAL PHYSICIAN CARE:
HOW CAN ITS USE BE ACCELERATED?**

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ABSTRACT

KATIE KANEY: Virtual Physician Care: How Can its Use Be Accelerated? (Under the direction of Sandra B. Greene, DrPH)

Although the provision of virtual care, often referred to as telemedicine, has been around for over fifty years, its use by physicians to care for patients has not been widely adopted. This dissertation examines how to accelerate the use of virtual physician care in three aims. Systematic literature reviews were used to understand more about the quality of virtual physician care (Aim 1) and barriers to its use (Aim 2). Aim 3 engaged physician leaders from Carolinas HealthCare System (CHS); the second largest public healthcare system in America, in key informant interviews to better understand what factors could accelerate the use of virtual physician care.

Results from the literature review on quality (Aim 1) concluded that virtual physician care results in at least comparable or better quality care. Aim 2, exploring the barriers to virtual physician care, identified nine (9) general themes as contributors to the lack of its adoption including physician attitude, system support, training, patient acceptance, legal/ regulatory issues, quality, reimbursement, liability and technology. Aim 3, focused on the acceleration of virtual physician care, revealed five (5) themes critical from the physician perspective to increase its use and more widespread adoption to care for patients. These themes included: 1. Effective technology to provide virtual

physician care must be available in a consistent, reliable format. 2. Providing physician care virtually must meet the same quality standards as the current model of care. 3. Institutional support to provide virtual physician care must be clearly articulated and recognized throughout the organization as an acceptable model of care. 4. The provision of virtual physician care must be efficiently integrated into the current workflow of the physicians in all care settings. 5. The healthcare environment must create a demand for virtual physician care.

Strategic recommendations to support the implementation of virtual physician care at Carolinas HealthCare System include: aligning the system strategy to support its use, identifying both physician and administrative champions, and pilot-testing virtual care programs to demonstrate its efficiency and confirm high-quality outcomes. As the adoption of virtual physician care increases at CHS, the plan also accounts for sharing knowledge through purposeful research to add to the literature on virtual physician care and taking an active role in national policy development. It is anticipated this model of care will continue to receive increased attention and its use can be positioned to help advance the work of public health and healthcare to improve the health of populations and individuals.

ACKNOWLEDGEMENTS

This work is a reflection of hundreds of amazing people- family, friends, committee members, cohort 6, faculty, interviewees, patients, leaders, and teammates- all committed to making the world a healthier, happier place.

"Don't you know, they're talkin' bout a revolution, it sounds like a whisper..."
Tracy Chapman

Thank you all for making this whisper a reality.

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Chapter I: Introduction

If the implementation of health care reform is successful, an additional 32+ million Americans will be formally insured and in need of physicians to care for them. Because our population is aging, the number of Medicare-eligible citizens is on the rise, resulting in increasing demand for healthcare providers. As a result of these factors and others, by 2020, our nation will face a serious shortage of both the primary care and specialist physicians needed to care for an aging and growing population.¹ The prospect of this physician shortage is troubling, regardless of whether it is a true gap in the number of trained primary care physicians or a distribution issue of specialist physicians, but it allows us an opportunity for innovation that may not have presented itself otherwise. These shortages can motivate us to develop new care platforms which address the problems of patient access to physicians while also improving the care provided to individuals and populations.

Access to physicians is a key determinant of population health and individual health status. Shi et al. conducted a U.S. state-level analysis to evaluate associations among income inequality, primary care, specialty care, smoking, and health indicators. Controlling for state-level economic and demographic characteristics, the authors concluded that an increase of one primary care physician per 10,000 population was associated with a 6% decrease in all-cause mortality and an approximately 3% decrease in infant mortality, low-birth weight and adult stroke mortality. The authors also

estimated that an increase of one primary care doctor per 10,000 persons would result in a reduction of 34.6 deaths per 100,000 population.² In an analysis of mortality data from 1996-2000 for 3,075 U.S. counties (99.9% of all U.S. counties), Starfield et al found the increased ratio of primary care physicians to population remained significantly associated with lower total, heart disease and cancer mortality.³ (Table 1)

Table 1: National Center for Health Workforce Analysis: Relationship Between Primary Care and Specialist Physicians Ratios and Mortality

**Relationship Between Primary Care and Specialist Physician Ratios and Mortality:
Regression Coefficients, Standard Errors, And Statistical Significance, 1996-2000**

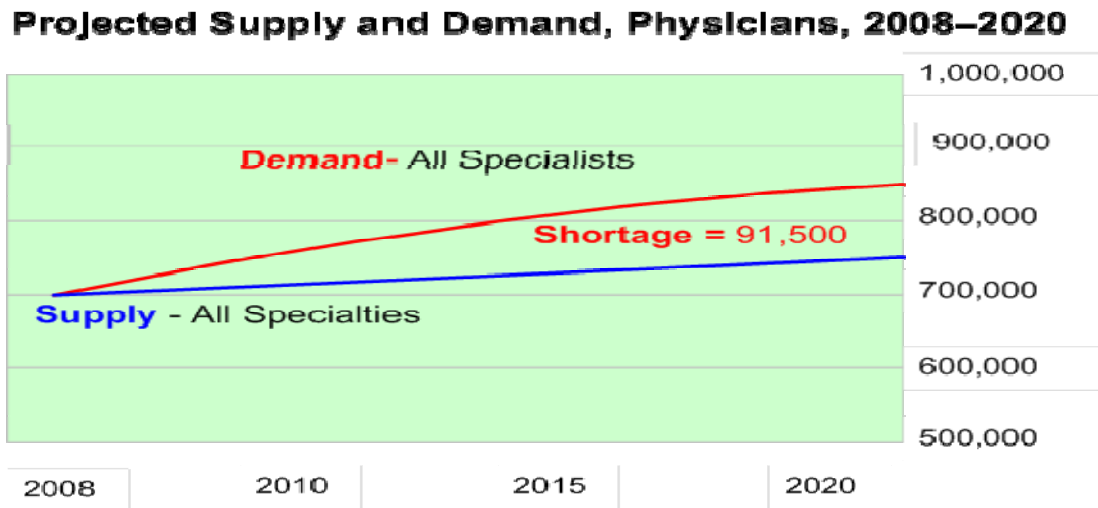
Mortality Measure (per 100,000)	Primary Care				Specialist			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
All-cause	-0.0353	0.0029	-0.0086	0.0035	0.0264	0.0068	-0.0031	0.0051
Heart	-0.0171	0.0011	-0.0117	0.0005	0.0031	0.0017	-0.004	0.0016
Cancer	-0.0039	0.0006	-0.0006	0.0005	0.0053	0.0007	-0.0003	0.0007

Source: National Center for Health Workforce Analysis, 2002 Area Resource File (Rockville, MD: National Center for Health Workforce Analysis, 2002)

American College of Physicians. *How Is a Shortage of Primary Care Physicians Affecting the Quality and Cost of Medical Care?.* Philadelphia: American College of Physicians; 2008: White Paper. (Available from American College of Physicians, 190 N. Independence Mall West, Philadelphia, PA 19106.)

According to the Association of American Medical Colleges (AAMC) Center for Workforce Studies, there will be 45,000 fewer primary care physicians than needed—and a shortage of 46,000 surgeons and medical specialists—in the next decade.⁴ (Figure 1) The shortfall in the number of physicians will affect everyone, but vulnerable and underserved populations will continue to feel the impact most severely. Finding more immediate means to address the issue of physician shortages is a key element of the healthcare reform platform.⁵

Figure 1: Projected Supply and Demand, Physicians



Source: AAMC Releases New Physician Shortage Estimates Post Reform September 30, 2010 <http://aamc.org/newsroom/newsreleases/2010/150570/100930.html> Accessed July 22, 2011

Specific to North Carolina (NC), a report published in 2007 by the NC Institute of Medicine provided evidence growth in the provider supply has not kept pace with growth in the overall population or the increased demand for health services in North Carolina. The state is likely to face a severe shortage of physicians, nurse practitioners (NPs), physician assistants (PAs), and certified nurse midwives (CNMs) over the next 20 years, absent major changes in the healthcare delivery system or significant increases in the number of providers.⁶

We have examples of successful innovations to improve access to physicians, including two models which are now recognized as standards of care in American medicine. For example, most primary care physician visits to patients in hospitals have been replaced by the use of new medical specialties such as hospitalists and intensivists, allowing primary care physicians to focus entirely on outpatient practice. Research by

Pham et al concluded the hospitalist medicine movement has moved beyond curiosity and insurgency to an established patient care model over the last 10 years.⁷ The use of mid-level providers (MLP) such as nurse practitioners and physician assistants to complement physicians and “extend” services is another model that has proven effective, especially when working as a team to triage work to the appropriate licensure level. Work performed at Inova Fairfax Hospital demonstrated that MLPs decreased physician workload and contributed to the learning of residents.⁸ Another study conducted at a Level 1 Trauma Center concluded that MLPs offered a clinically effective and resource efficient alternative to residents on a trauma service.⁹

Both of these care models began as innovations to increase patient access to clinicians and over time became recognized standards of care. What was it that allowed these models of care to grow beyond innovative ideas and become the acceptable models? In the late 1990’s, Watcher examined the emergence of the hospitalist model of care and offered some insight into its proliferation into mainstream American medicine. He credits a convergence of several elements: the conflict between hospitals and physician incentives, the implementation of “diagnosis related groups” (DRGs), a trend for more rapid hospital discharge, and a higher threshold for hospitalization. According to Watcher, these elements came together to create a change in the nature of hospital care and a change in the model of care.¹⁰

Perhaps the same kind of change is occurring with the emergence of accountable care organizations, health reform, expansion of Medicaid and the increased importance of

the medical home in coordinating patients' total healthcare needs. The advent of team-based care sets new expectations requiring physicians to participate in the seamless coordination of care. The Agency for Healthcare Research and Quality (AHRQ) notes that one of the key characteristics of a collaborative approach to care includes the ability to connect and communicate across and amongst sites of care, care providers, and data repositories.¹¹ Accountable care organizations may allow for the emergence of new models which could play a significant role in increasing patient access to physicians, such as virtual physician care.

Virtual Physician Care: What is it?

It has been over 45 years since the first patient was viewed and cared for by a physician who was not co-located with the patient, creating the possibility of transforming the traditional medical care platform of face to face interaction.¹² Research by Hersh et al. concluded there are over 100 definitions of virtual care, which is sometimes called telemedicine, ranging from image sharing to patient/clinician interaction to care via video.¹³ Sood et al. performed an extensive literature review producing 104 peer-reviewed definitions of telemedicine, and in doing so were able to recommend their own definition of modern telemedicine: "a branch of e-health that uses communications networks for delivery of healthcare services and medical education from one geographical location to another".¹⁴ The Institute of Medicine (IOM) defines telemedicine in this way: "It encompasses all of the health care, education, information, and administrative services that can be transmitted over distances by telecommunications technologies."¹⁵

Telemedicine remains difficult to define but its increasing use across the healthcare industry is bringing it attention. Several virtual care programs are currently being used on a daily basis to care for patients across America. Physicians have been providing care telephonically for years, consulting with each other on patient care plans and coordination. Radiological images and other electronic medical reports such as electrocardiograph, electroencephalography, and electromyography (EKG/ EEG/ EMG) studies are transmitted between practitioners for review and diagnoses. The efficiency and quality of this virtual sharing of information to best utilize physician expertise for patient care has been well documented, including research conducted by Ricci et al. that examined the impact of teleradiology in orthopedic surgery. In 21% of the patients with acute fractures, the care plan was changed after an assessment that included electronically transmitted images by the attending physician.¹⁶ In the world of cardiology, the results of the CONNECT (Clinical Evaluation of Remote Notification to Reduce Time to Clinical Decision) trial, conducted by Dr. George Crossley (University of Tennessee College of Medicine, Nashville), concluded that remote follow-up of EEGs actually creates reliable outcome measures which improve care as compared to the traditional office visit.¹⁷

The combination of virtual care with face to face interaction between patients and physicians in the form of telephonic care and teleradiology has been integrated into daily medical practice. However, there is less experience and evidence regarding the virtual care of patients by physicians *in lieu* of a face to face interaction. This model allows a physician to provide care directly to the patient in a form other than co-located. The goal of this interaction is not to simply share information or review study results, but to

obviate a trip to the doctor's office. Every element of that visit to the doctor's office would be completed through a virtual connection, including an intervention and the development of a plan of care. In the appropriate circumstances, this more efficient means of clinical care could help extend physician resources to increase access, without necessarily adding additional physician resources. It also challenges the long standing practice in medicine of the patient coming to the physician; virtual care would invert this relationship, allowing the physician to come to the patient.

Some of the most promising work in virtual care for patients is being done by the Veterans Health Administration (VHA) in the Department of Veterans Affairs, which provided virtual care to over 230,000 patients in 2008.¹⁸ At the 2009 National Institute of Health (NIH) conference on the Future of Telehealth, members from the VA team presented their experiences of caring for patients in virtual care models. The experiences considered most successful included treatment for depression, hypertension, heart failure, and posttraumatic stress disorder.¹⁹ This conference highlighted the need for research to produce evidence of the efficacy of a virtual care experience, not only for the safety of patients, but also to provide the foundation for a telemedicine infrastructure that serves the general public. The VA prioritized six areas of research most relevant to the efficient development of telemedicine in America²⁰:

1. Randomized control trials (RCT) to investigate adaptations of existing evidence-based practices to telemedicine modalities
2. Address situations, scenarios, illnesses, or populations where telemedicine modalities are particularly indicated as first-line interventions over treatment as

- usual or face-to-face encounters (ex. behavioral health, ambulatory disorders, intense anxiety)
3. New research strategies that match the pace of technology development in order to reduce the time lag between initiation of research and widespread adoption of new technology into standard healthcare
 4. Improving patient access to care via telemedicine technology
 5. Economic impact or benefits of telemedicine interventions
 6. Investigate how telemedicine technologies can be incorporated into and enhance new models of care

There are other notable examples across America of centers currently working on the integration of virtual care into the care model for the benefit of patients. In September of 2011, the U.S. Health Resources and Services Administration (HRSA) awarded Regional TeleHealth Resource Center grants to three groups located in Maine, Virginia, and Indiana. In Charlottesville, Virginia, the University of Virginia (UVA) Center for Telehealth will use its grant to establish the Mid-Atlantic Telehealth Resource Center, which will link urban and rural healthcare providers in the District of Columbia, Virginia, Delaware, Kentucky, Maryland, North Carolina, and West Virginia. The UVA program provides over forty sub-specialties and eighty-five locations across Virginia.²¹

Despite the inherent difficulties in transforming models of care, it is a very dynamic time. Efforts by organizations such as HRSA, the American Telemedicine Association (ATA) and the Veterans Health Administration (VHA) highlight the value of telemedicine through research and showcase telemedicine's success across the United

States. The ability of virtual care to help overcome barriers such as access to physicians, transportation challenges, mobility issues of the aged and/ or disabled, and even racial/ethnic and socioeconomic disparities increase its attractiveness to both clinicians and patients. While this is an indication that virtual care is gaining recognition, there is opportunity for more research on how to effectively accelerate its use.

Chapter II: Study Design: Virtual Physician Care: Three Aims

In the wake of healthcare reform and the need to increase access to physicians, it will become important to innovate around new care models which transform the traditional face to face healthcare service delivery system. The goal of the research is to explore how to accelerate the use of virtual physician care. While it is recognized that other clinical providers are very important, the transformation of care practices in medicine relies heavily on the support of physicians.²² While the team-based approach to medicine is gaining traction, many providers still operate under the direction of a physician including mid-level providers, nurses, respiratory therapists etc. Furthermore, some definitions of the medical home concept include expanding the providers on a team to include pharmacists, psychologists, psychiatrists, social workers, and case managers, all working under the direction of a physician.²³ If a new model of care to reach patients is to be incorporated into the medical practice, it must be validated by the physician that the care can be delivered safely, effectively and efficiently through alternative models. The doctors, in turn, can help educate and lead the acceptance of a new means to help care for patients within the other ranks of clinical providers. Consequently, it is important to first understand the research and findings regarding two specific issues: quality of virtual physician care and barriers to its adoption. This dissertation explored these concepts using three specific aims:

Aim 1: What is the quality of virtual physician care?

This aim was accomplished by systematically reviewing the literature. For an innovation to be worthwhile for a physician to adopt, it must first be proven to be comparable or better than the current quality of care provided to patients through another model. This dissertation employed a systematic review of the literature examining the comparability of traditional physician care versus virtual physician care to determine its quality.

Aim 2: What are the barriers to the adoption of virtual physician care?

This aim was accomplished employing a systematic review of the literature. If the opportunity to provide virtual physician care has been possible for several decades, and the results of the systematic review of its quality are predominately proven effective, the next question to consider is why its practice has not been widely incorporated into the medical practice. The second systematic review of the literature sought to understand the barriers to adoption of virtual physician care.

Aim 3: How can the adoption of virtual care be accelerated?

The third aim focused on answering the question of how the adoption of virtual physician care can be accelerated. Key informant interviews were used to explore this question, utilizing the information gained in Aim 1 and Aim 2 to develop the interview guide. Physicians who are in leadership roles were asked how best to accelerate the adoption of virtual care among physicians. Physicians play a vital role in creating transformative change in health care. Understanding the key elements physicians

perceive as necessary to utilize virtual care should be instrumental in the acceleration of its use.

Furthermore, large American health care systems can play a key role in establishing best practice and contributing to evidence based medicine. Carolinas HealthCare System (CHS), the second largest public healthcare system in the United States, serves diverse communities in two states across the full care continuum. The scope of CHS programs and initiatives already underway within this clinical environment make it an ideal setting for research regarding virtual care. The physician leaders selected for the study were members of Carolinas HealthCare System from varied backgrounds and training. This sampling approach allowed exploration of virtual care on a broad and effective scale, collecting information which can then be shared externally with application to other physicians and healthcare systems.

Carolinas HealthCare System: Background

Carolinas HealthCare System is headquartered in Charlotte, North Carolina, providing over 15% of the clinical care to citizens of the Carolinas. Driven by its mission, vision and system strategy, it operates a diverse network providing over 10 million patient encounters annually in over 700 care locations in North and South Carolina, including academic medical centers, hospitals, healthcare pavilions, physician practices, destination centers, surgical and rehabilitation centers, home health agencies, nursing homes, and hospice and palliative care. (Figure 2) These operations comprise over 6,300 licensed beds and include four Joint Commission Primary Stroke Centers (JCPSC's), one

level I trauma center (LITC), one level II trauma center (LIITC), and three level III trauma centers. Research is one of three key core missions of CHS, along with patient care and education. The research programs within CHS are numerous and diverse, including roughly 660 active Internal Review Board approved clinical studies.

Figure 2: Carolinas HealthCare System: Vision, Mission, and Strategy

Carolinas Healthcare System: Our Vision

Carolinas HealthCare System will be recognized nationally as a leader in the transformation of healthcare delivery and chosen for the quality and value of services we provide.

Carolinas HealthCare System: Our Mission

The mission of Carolinas HealthCare System is to create and operate a comprehensive system to provide healthcare and related services, including education and research opportunities, for the benefit of the people it serves.

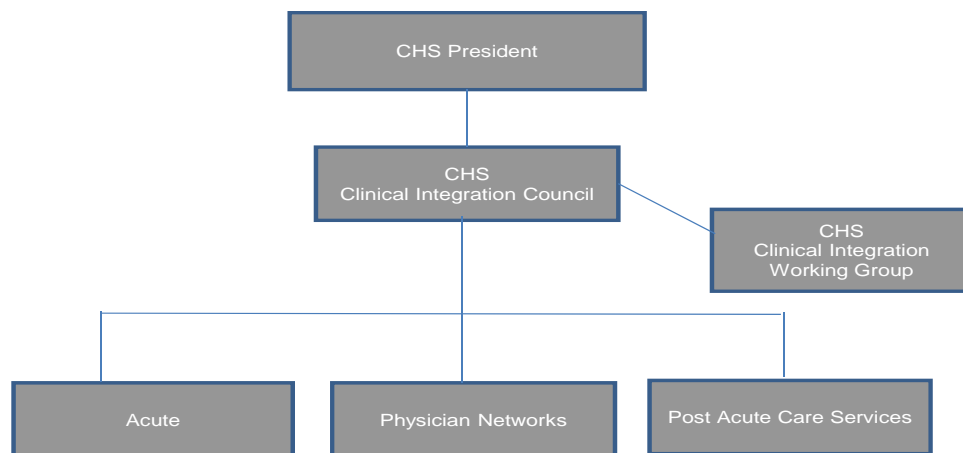
Carolinas HealthCare System: Statement of System Strategy

Carolinas HealthCare System will achieve its vision through the development of a single unified enterprise focused on developing enduring relationships with our patients based on superior personalized service and high quality outcomes.

As CHS addresses its strategic imperatives in the context of a rapidly changing environment, it is useful and important to understand the structure and positioning of leadership groups to effect change throughout the organization. Many of the strategic priorities require clinicians to work together in new and seamless ways to develop (1) the best analysis of the complex current state and (2) the platform on which to execute action plans synergistically. Further, clinical leadership, particularly including physician leaders, must improve its ability to act with shared and distributed responsibility for valued outcomes, whether they are economic, quality, efficiency, service, or culture-related.

The Clinical Integration Council (CIC) was created in 2011 to serve as the consolidation point of clinical input to strategic development and execution for CHS. (Figure 3) Its governing body is led by Dr. Roger Ray, CHS Chief Medical Officer, and reports to the President of CHS, Mr. Joseph Piemont. Members of this council primarily include physician leaders across CHS. They create and maintain a prioritized ranking of clinical services to be integrated, and oversee the implementation of these services to ensure successful outcomes. They promote seamless care across the continuum, avoiding variability and duplication, while maintaining quality care of patients as the ultimate priority. The CIC also works to remain flexible in order to be ready for reforms related to external clinical integration initiatives that may impact the System. This includes requirements imposed by regulatory bodies such as the Centers for Medicare and Medicaid (CMS) for readmission rates or standards set by third party accreditation agencies such as the Society of Chest Pain Centers on evidence-based best practices for Acute Coronary Syndrome, or The Joint Commission for Primary Stroke Certification for the care of acute stroke patients.

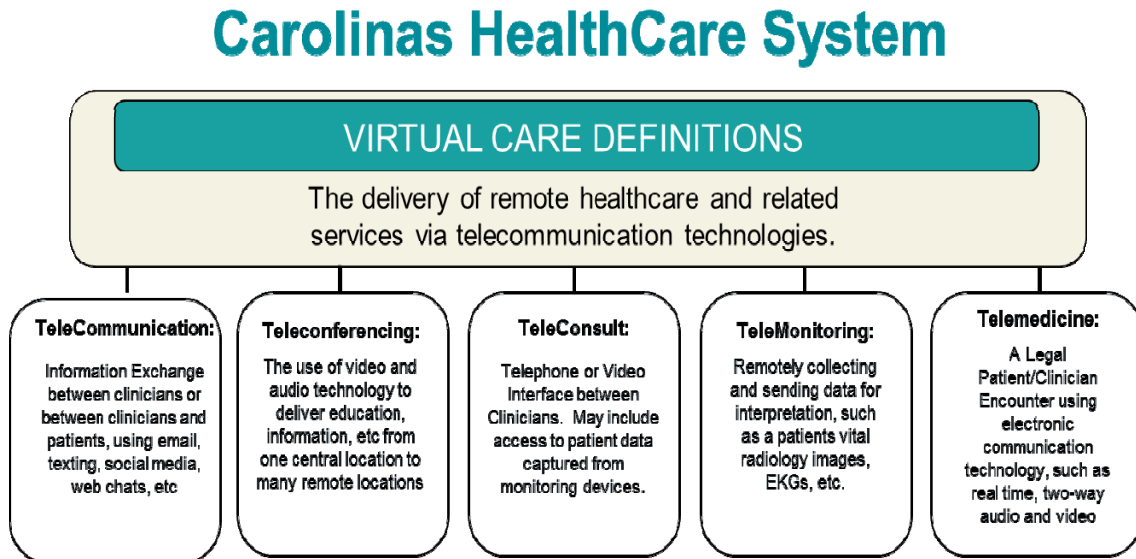
Figure 3: Schematic of Organizational Positioning of Carolinas Healthcare System Clinical Integration Council



Specific to the use of virtual care across CHS, a virtual care strategy committee was established in 2011, also championed by Dr. Ray. The goal of this CHS committee is to improve patient quality, safety and access through effective deployment of telemedicine technologies across CHS. This committee established the CHS rules of engagement for virtual care service to provide patients access to medical services without the need to travel or to compromise quality and safety, while offering CHS physicians and clinicians opportunities to expand their reach beyond their own primary service areas. Additionally, physicians utilize this technology to extend access for consultations, distance learning, research and academic activities with the goal of integrating seamlessly into the already established systems of care.

For CHS, virtual care is defined as a healthcare interaction where participants are not co-located together and a technology allows for communication to occur. It is further refined to five (5) categories to help us establish the appropriate technology solutions and system infrastructure to support the clinical interaction. (Figure 4)

Figure 4: CHS Virtual Care Definitions



CHS is actively providing telemedicine services in three specialty areas: orthopedics behavioral health, and stroke. Dr. Edward Hanley, Chair of the Department of Orthopedics at Carolinas Medical Center, has provided orthopedic consultations virtually to Mecklenburg County Jail inmates for over 10 years. Since 2008, telepsychiatry has been provided by Charlotte based psychiatrists to six emergency departments, providing care to approximately 100 patients per month. Since 2010, telestroke support has been provided to Carolinas Stroke Network sites as far away as Mt. Pleasant, South Carolina, located 218 miles from neurologists based in Charlotte, North Carolina.

Although these demonstration projects are promising and important, CHS has not adopted the virtual physician care platform more broadly. However, even with limited experience, CHS is in an excellent position to look at new care delivery platforms, such as virtual care, to transform traditional models of care to increase physician access without compromise to quality and safety.

Contributions

This research will contribute to the knowledge base about the efficacy of virtual physician care along with key elements to help accelerate its use. This should result in beneficial changes in practice to assist both clinicians and patients in the public health and health care arena. Study findings will also highlight areas where further interventions may be needed to support the adoption of virtual physician care.

Significance

Although this dissertation does not explore in detail technological intricacies, its relevance to the timeliness of this research is significant. The affordability and functionality of technology to provide virtual contact for people and populations has rapidly improved. The healthcare industry has traditionally lagged behind in taking advantage of technology to advance health and wellness. Government intervention has been called for to speed the adoption process for healthcare information technology (HIT), based on the widespread belief that its adoption, or diffusion, is too slow to be

socially optimal.²⁴ The focus of the research on virtual care, an emerging mechanism of health care delivery, should provide meaningful insight into the benefits and risks of virtual care, allowing us to appropriately capitalize on its potential to serve patients and communities in health and wellness.

Chapter III: Methodology

A. Research Aims

Aim 1: What is the quality of virtual physician care?

Scope and Methodology

The goal of this literature review was to search for all relevant randomized control trials (RCT) testing the comparability of traditional care versus virtual care. The purpose of reviewing the literature is to determine whether virtual care is as safe and effective as traditional care delivery between physicians and patients. This is a first step in determining if virtual physician care is a comparable care model that would be beneficial to accelerate and scale-up more broadly. The knowledge obtained was also used to inform the interview questions used in Aim 3 of this research- key informant interview with physician leaders. Randomized control trials were used as a selection criteria since it is accepted by medicine as objective scientific methodology that, when ideally performed, produces knowledge untainted by bias.²⁵

To note, it was also decided psychiatry would be excluded. At the time of this study, telepsychiatry was in practice in several states and further along the acceleration continuum than other medical providers. An initial review of the literature on quality

returned thousands of articles, and upon cursory review, was weighted heavily toward research on telepsychiatry. Including the research on telepsychiatry could potentially dilute information available on the research done regarding quality in other practices and specialties on the provision of virtual care.

Search Terms and Criteria

The literature search was conducted with the assistance of a medical research librarian on MEDLINE including years 1993 to 2011, language restriction to English, and randomized control trials (RCT). Since terminology for virtual care has not been standardized, our search used the following key terms to identify articles most relevant to clinical intervention and quality in a virtual care model. (Table 2) A comprehensive list of the search criteria is included in Appendix A.

Table 2: Quality Literature Review Search Terms

Virtual Care	AND	Clinical Effectiveness	AND	Outcomes
Telehealth		Evidence based		Interventions
Telemedicine		Treatment		Transform care
Ehealth		Randomized Control Trial		

Aim 2: What are the barriers to the adoption of virtual physician care?

Scope and Methodology

The goal of this literature review was to determine the published research about barriers to virtual physician care. The purpose was to understand what could be hindering acceleration. This is valuable foundational information to aid the structure, format,

content, and administration of the key informant interview questions on the acceleration of virtual physician care, detailed in Aim 3 of this research.

Search Terms and Criteria

The literature search was conducted with the assistance of a medical research librarian on MEDLINE including years 1996 to 2011, language restriction to English and exclusion of letters to the editor and newspaper articles. The following key terms were used to identify articles most relevant to physicians, virtual care and barriers to adoption of a virtual care model by physician. (Table 3) A comprehensive list of the search criteria is included in Appendix B.

Table 3: Barriers Literature Review Search Terms

Virtual Care	AND	Physician	AND	Barriers
Telehealth		Doctor		Accept
Telemedicine				Adopt
Ehealth				

Aim 3: How can the adoption of virtual care be accelerated?

To learn more about the acceleration of virtual physician care, a series of key informant interviews evaluated the perceptions of fifteen (15) physician leaders from Carolinas HealthCare System regarding the “must haves” for accelerating the adoption of virtual physician care. The interviews were conducted to learn more about what physician leaders perceive are necessary to accelerate virtual care. For the purposes of this study, virtual physician care was defined as the use of a technology to care for a patient in lieu of an in-person interaction.

Data Sources: Selection of Key Informants

The selection of key physician leaders was purposeful, highlighting not only their clinical training as physicians but also their positional authority through which they can influence and drive the adoption of new models of care. At CHS, a council comprised of physician leaders, the Clinical Integration Council (CIC) is charged with setting the course for evidence based, clinically integrated care pathways across the entire CHS Enterprise. The list of key informants first reflects the members of the CIC and then any other physician leader over a service line not represented was added. Purposeful sampling of key informants with extensive knowledge of their specialty, team of physicians and also CHS mission, allowed for in-depth study and understanding of the proposed research question.

Fifteen physician leaders were interviewed, after which, saturation of themes was achieved.

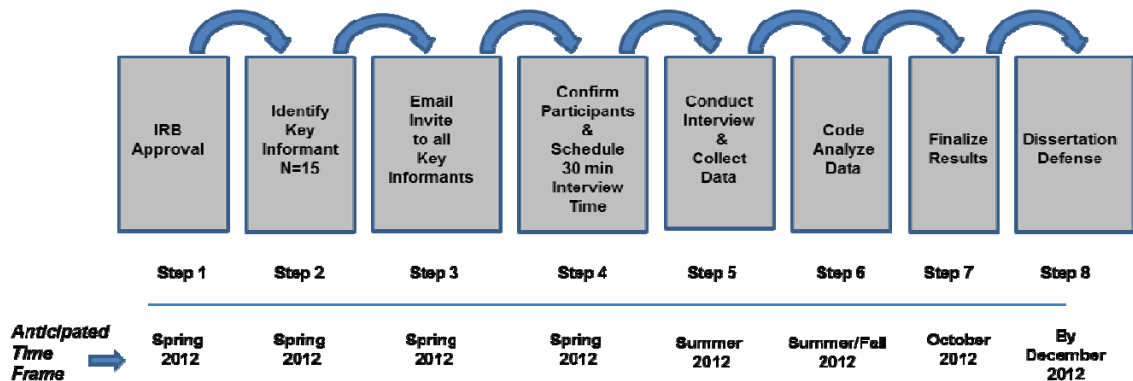
Potential subjects were contacted by email to request their participation, at which time a brief description of the study was shared using a standardized script in English (Appendix C). For all agreeing to participate, a face to face meeting was set by either telephone and/or email. Each key informant interview took approximately 10 to 15 minutes, conducted in a private room. The sessions were recorded and the recordings transcribed.

A question guide was developed and submitted to the UNC Institutional Review Board (IRB Study #12-0839) for approval. The interview guide contained open-ended questions, with each key informant being asked the same questions. The full set of interview questions is available in Appendix D.

There was no monetary or explicit non-monetary incentive to participate in this study. In addition, there were no costs borne by subjects, other than their time.

The research timeline was set and followed to complete the research in a timely manner so results could be published in a reasonable time frame of interview completion. (Figure 5)

Figure 5: Research Time Line



Data Collection:

Once participants agreed to be interviewed, an appointment was scheduled at a time convenient to them. The meeting was in a private room, conducted face to face. All

sessions were recorded with participant permission. The interview took place in accordance with the interview protocol (Appendix D).

Consent and Enrollment: The principal investigator obtained written consent from the physician leader at the time of the face to face interview (Appendix E). The consent form was reviewed orally by the principal investigator and the participant was invited to ask detailed questions about the study. Study participants were consented and interviewed in English. All study procedures were described in detail such that the participant was fully informed of their requirements while in the study. During this consent process, the physician leaders were reminded they were free to choose to take part in the research study or not, and that their decision did not affect their employment at the healthcare system. This was reinforced by a statement from Dr. Roger Ray, Chairman of the Clinical Integration Council, restating participation was entirely voluntary, and that there would be no negative consequence and no expected appropriate answers to the questions. The potential participant could agree or decline to participate in the study. Those who consented to participate in the study were enrolled.

Privacy: During the consent process, all participants were informed that information they provided through interviews would be confidential (i.e., not shared with anyone outside of the research team) and voluntary (i.e., they are not obligated to answer any question). Interviewees were told that they were free to take breaks and/or terminate the interview at any time.

Privacy and confidentiality were protected as follows:

1. All interviews with physician leader participants were conducted in private locations of the interviewees choosing.
2. Identification numbers, rather than names, were used on research materials to identify participants.
3. Hard copies of data and collateral materials such as consent forms were stored separately in a locked cabinet in the office of the principle investigator. All interview data were stored in password protected files on a computer at in the principal investigator's office.

As per the guidelines of ethical research, each individual who participated in this study was first contacted by email. All informants in this study provided voluntary, written and informed consent, gave verbal permission to tape record the interview, and understood fully that their answers are provided with anonymity. Once the data was analyzed and the study completed, all recordings will be destroyed to ensure that no responses are linked to an individual. The results are presented in the aggregate and the names of the individuals kept confidential. Descriptors of key informants are included, but in order to maintain confidentiality of the respondent, these participants' names are not included.

The interview instrument was pre-tested by conducting mock interviews with the Chief Academic Officer at CHS, who serves on the dissertation committee, and two other physicians who are championing virtual care applications at CHS currently, but do not hold the service line leadership roles.

Interview Process:

The interview process took place in a face to face manner and included questions that moved from general to specific, with the goal of increasing the interviewees comfort with the topic and a natural cadence to answering the questions. It was clearly explained that there were no “right answers”; rather the intention was to learn about their opinions and perspectives as related to the acceleration of virtual physician care.

Since I am an employee at Carolinas HealthCare System and work with the physicians participating in the interview, it was recognized that my role as an interviewer may introduce bias. Traditionally, what the interviewer brings to the research from background and identity has been treated as “bias,” something whose influence needs to be eliminated from the design, rather than a valuable component of it. However, the explicit incorporation of the identity and experience of the interviewer (what Strauss, 1987, calls “experiential data”) in the research has gained much wider theoretical and philosophical support (e.g., Berg & Smith, 1988; Denzin & Lincoln, 2000; Jansen & Peshkin, 1992; Strauss, 1987). Using this experience appropriately in the research can provide a source of insights, hypotheses, and validity checks.²⁶

The opening question was one of fact and description to ease the participant into the discussion. This first question inquired about his or her tenure at CHS and his or her current physician leadership role. This question was purposeful for two reasons. First, it was an easy question to open with, and second, it confirmed the role of the physician within the organization as a leader, a key criterion for selection as a key informant.

The next question was intentionally broad, asking about overall familiarity with the use of virtual physician care—either personally or by physicians on their care team. Physician leaders with a familiarity of virtual care may already have a grasp of its utility, and also have formed an opinion based upon personal experience as to their preference for use as a viable model of care. It was important to note the demeanor of the informant during the answer to this question as, in some cases, physical demeanor indicated any slant towards favorable or unfavorable opinions.

I developed a comfortable rapport with the interviewee as we entered into the key questions. I used a semi-structured approach and led with specific questions, but the informant talked about whatever they wanted in response to the question. Probes were used to invite clarification and ensure detail was provided about each key point raised. Probes included findings from the two literature reviews conducted on quality and barriers to virtual care. These probes also explored in depth the advantages and/or risks of virtual physician care. Probes encouraged specific feedback in regard to overcoming risk and accelerating realization of advantages. There were five open-ended questions and the questions were asked in a flexible order that took in to account the flow of the conversation, not necessarily in any fixed, specific order.

Specifically, the interview explored key elements necessary to enable the physician leader to accept a model of virtual physician care. This included what must be in place for physician leadership to advocate for virtual care as a standard model of care in Carolinas HealthCare System.

The summary question at the end of the interview helped to clarify any earlier responses that were confusing or needed more detail. This also offered a chance for the participant to add any last thoughts or final comments that may be relevant to the study. The data from the physician leaders was analyzed separately. The interviews were sorted, manually coded and general themes identified.

During the interview, I was careful not to provide my opinion. This included not offering solutions to problems or barriers mentioned, or consideration of our organization's likelihood to act upon recommendations of actions; however, I did offer as appropriate a scenario of their suggested solutions to further explore the details of what may be in place to help the solution be successful. I believe my interview subjects were not influenced by my presence or opinion.

Data Analysis:

Immediately after each interview, the digitally recorded files were uploaded and saved on a password-protected computer in the principal investigator's office. The interview files were sent electronically to an individual on the research team for transcription. Each subject was given a numeric identifier so their specific comments could not be linked to the data. Interviews were transcribed verbatim and verified against the audio recording to ensure that all thoughts and opinions were included in the analysis. Once verification of the transcripts was complete, the investigator began the manual coding process.

In addition to the principal investigator, two individuals not involved in the interview but on the research team independently reviewed all (100%) of the transcripts to identify codes and notable quotes. A code book was not created. Following the coding of all interviews, coding reports were generated for each of the independent researchers in order to systematically analyze and report on the information received during the key informant interviews. Inter-rater reliability was measured after all three coders completed their work. A threshold of at least 90% was achieved using joint probability of agreement. From the codes identified, the principle investigator reviewed all transcripts and codes again, refining into themes and descriptors to accurately represent the findings from the key informant interviews.

B. Study Limitations

There are limitations to the study design. First, the systematic review of literature focused on quality of virtual care only included randomized control trials (RCT). There may be other means to validate quality of virtual care services other than RCT studies only, but in the medical field it is most commonly accepted. Second, the systematic review on literature focused on barriers to virtual care that relied upon physician opinions and not on other clinicians, patients, or family members. This creates a void of knowledge from other key players in the development of virtual physician care services. Since the focus of this research was acceleration of virtual physician care, the physician perspective was specifically considered.

Study limitations also existed for the key informant interview portion of the research. First, the key informant interview participants were derived from a single healthcare system. This will hinder the scope of opinions and feedback from those practicing in a different system and a different environment where care is provided to patients. Those participating in the interviews reflected diverse tenure, experience and medical training.

Second, the key informants were physician leaders only. The physician leader may not have had direct experience with virtual care, although all were effective in describing it and expressing their understanding of its definition for purposes of this research. Those without first hand use of virtual care have a knowledge base different from that of a physician who may have experience providing virtual care. However, physician champions are necessary to facilitate change management in the healthcare industry supporting physicians as the research focus. Using physicians only excludes knowledge from other key players in the use of virtual physician care, including the patient, families, administrators and other clinicians in the healthcare field. The patient and community perspective is important, so research understanding the risks and benefits from end user would be helpful. The studies should focus on all segments of the population to be inclusive of understanding the varying opinions based upon age, ethnicity, gender, socio-economic status, geography and disease or wellness state.

Finally, since all of the interviews were conducted by the same researcher, bias may have been introduced into the results of the key informant interviews. The relatively

small sample size, the sampling methodology, and participation may have introduced selection bias. This limitation was partially addressed through purposeful inclusion of representatives already selected to serve in the role of physician leader for CHS as well as additional research analysts to participate in the coding of the key informant interview data.

Chapter IV: Results

A. Discussion of Results and Summary of Findings

Aim 1: What is the quality of virtual physician care?

The results of the literature review yielded important information necessary to create a foundation to address the question of how the use of virtual physician care can be accelerated. It is prudent to perform due diligence to validate the comparability of quality between virtual care and traditional care before work is done to help its adoption. This review provided a baseline of information from the current research that can validate the quality of virtual care, recognizing there is work to be done to increase the amount of research in this area to contribute to its validation.

The systematic review identified 118 articles. Exclusion criteria were established and used to eliminate articles which were not randomized control trials (RCT) and did not involve care interventions between a patient and physician. (Table 4)

Table 4: Quality Systematic Review Results: Exclusion/ Inclusion Summary

Excluded:	
Communication only- no clinical intervention	25
No patients	26
No physician involvement	14
No measure of quality (satisfaction/ cost etc.)	5
Total Excluded:	70
Included:	
Care intervention with patients and physicians	48
Total Included:	48
Total Articles Reviewed:	118

All 118 articles were partially reviewed by reading each abstract and applying the exclusion criteria. Of the 48 articles selected for full review, critical information from each article was abstracted and entered into a database. Information was collected from each research study to determine the breath of impact across the health continuum including the following: health focus, virtual care model/intervention, technology, number of patients. The literature was also abstracted to compare clinical effectiveness and whether or not the virtual care model was comparable to the traditional care model (Appendix F).

While virtual care is a topic which is gaining attention in the medical arena, the depth of clinical research to measure its clinical effectiveness is not robust. The articles reviewed span several specialties, but with a yield of only 48, few articles were identified using randomized control trials (RCT) as the research method. (Figure 6) When distilled further, the research becomes less robust, especially when trying to understand the effects by specialty, as some specialties have no RCTs published on virtual care. (Figure 7)

Figure 6: Quality Systematic Review Results: Comparable, Less Effective, More Effective, Not Enough Research

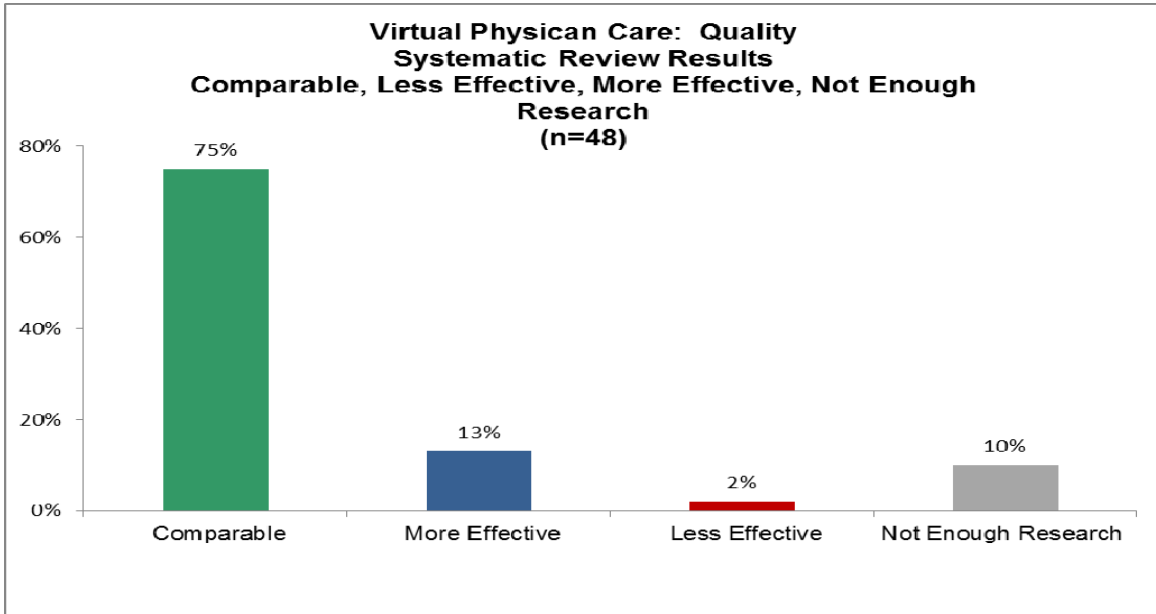
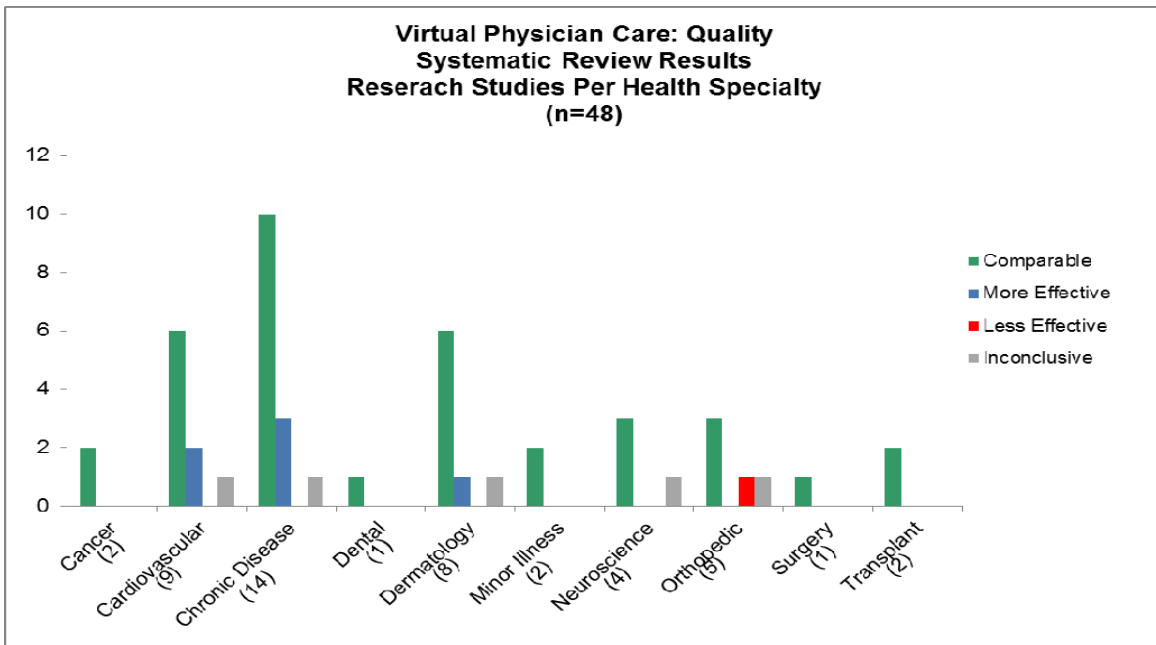


Figure 7: Quality Systematic Review Results: Research Studies Per Health Specialty



Nevertheless, the little research that does exist does offer some promising results to highlight. For example, Vitacca et al. studied patients with Chronic Obstructive Pulmonary Disease (COPD) and concluded the telemanaged group experienced

significantly fewer hospitalizations (-36%), urgent physician calls (-65%) and acute exacerbations (-71%).²⁷ Even more promising is the work done by Shea et al. in New York focused on diabetics entitled The Informatics for Diabetes and Education Telemedicine (IDEATel) Project. Their research demonstrated that telemedicine case management versus usual care resulted in net improvements in HgbA1c, LDL-cholesterol, and blood pressure levels over 5 years in medically underserved Medicare beneficiaries. Strengths of this study included its focus on an elderly population and its longitudinal nature.²⁸

The results are not just encouraging for patients with chronic disease; studies also show positive results in specialty and acute care areas. The research conducted in Germany by Audebert et al in the Telemedical Project for Integrative Stroke Care (TEMPiS) study demonstrated the implementation of a stroke network with telemedicine support to improve access to neurologist services was associated with improved outcomes at twelve (12) months and thirty (30) months.²⁹ (Table 5)

Table 5: Telemedical Project for Integrated Stroke Care Results

Long-Term Effects of Specialized Stroke Care With Telemedicine Support in Community Hospitals on Behalf of the Telemedical Project for Integrative Stroke Care (TEMPiS)

Combined Outcomes After 12 and 30 Months (Unadjusted)

Outcome	12 Months			30 Months		
	Intervention Group, N=1883	Control Group, N=1085	<i>P</i>	Intervention Group, N=1860	Control Group, N=1075	<i>P</i>
Death or Institutional Care	428 (22.7)	265 (24.4)		619 (33.3)	376 (35.0)	
Institutional care	177 (9.4)	124 (11.4)		161 (8.7)	109 (10.1)	
At home	1278 (67.9)	696 (64.1)	0.038*	1080 (58.1)	590 (54.9)	0.094*

Death or Institutional Care or Severe Disability	12 Months			30 Months		
	Intervention Group, N=1876	Control Group, N=1077	<i>P</i>	Intervention Group, N=1855	Control Group, N=1073	<i>P</i>
Dead	428 (22.8)	265 (24.6)		619 (33.4)	376 (35.0)	
Institutional care	177 (9.4)	124 (11.5)		161 (8.7)	109 (10.2)	
At home with severe disability	261 (13.9)	209 (19.4)		207 (11.2)	142 (13.2)	
At home without severe disability	1010 (53.8)	479 (44.5)	<0.001†	868 (46.8)	446 (41.6)	0.006†

*Unadjusted outcome “at home” was tested against the combined outcome of “death and institutional care.”

†Unadjusted outcome “at home without severe disability” was tested against the combined outcome of “death and institutional care and at home with severe disability.”

Source: Audebert HJ, Schultes K, Tietz V, Heuschmann PU, Bogdahn U, Haberl RL, Schenkel J; Telemedical Project for Integrative Stroke Care (TEMPiS). Long-term effects of specialized stroke care with telemedicine support in community hospitals on behalf of the Telemedical Project for Integrative Stroke Care (TEMPiS). *Stroke*. 2009 Mar;40(3):902-8. Epub 2008 Nov 20. PubMed PMID: 19023095.

Death Rates and Adjusted ORs for Death at Various Times After Stroke Admission

Time After Stroke Admission	Intervention Group Deaths (%)	Control Group Deaths (%)	Adjusted* OR	95% CI
10 days	143 (7.4)	101 (9.0)	0.86	0.64–1.15
30 days	200 (10.4)	141 (12.7)	0.84	0.65–1.09
90 days	289 (15.1)	186 (16.8)	0.93	0.74–1.17
365 days	430 (22.7)	268 (24.5)	0.98	0.80–1.19
900 days	599 (32.0)	373 (34.5)	0.95	0.79–1.14

*If treated in the intervention group and adjusted for all baseline parameters

Source: Audebert HJ, Schultes K, Tietz V, Heuschmann PU, Bogdahn U, Haberl RL, Schenkel J; Telemedical Project for Integrative Stroke Care (TEMPiS). Long-term effects of specialized stroke care with telemedicine support in community hospitals on behalf of the Telemedical Project for Integrative Stroke Care (TEMPiS). *Stroke*. 2009 Mar;40(3):902-8. Epub 2008 Nov 20. PubMed PMID: 19023095.

The unique aspect of this study is it is one of the first showing the benefit of stroke care extended to community hospitals with access to neurology services through telemedicine. Because gaining access to specialist services is a challenge faced by many across the country, it is encouraging to learn that the necessary medical expertise can be extended through virtual care platforms without compromise of quality.

Another study by Burgess et al compared conventionally proctored endoscopic sinus surgery cases with those that were teleproctored. The lack of differences in perioperative clinical outcomes between groups demonstrates the clinical safety of live, intraoperative consultations for selected procedures in a controlled environment.³⁰ Burgess suggests this approach might be valuable in rural areas where the local general surgeons might need assistance from specialists to perform emergency procedures or procedures they may perform infrequently. This demonstrates the potential impact of virtual care to prevent the transfer of patients to another facility while maintaining support to the physician providing the service locally to maintain quality.

Dermatology is a well-suited area for telemedicine because the nature of this care provision is based upon the review of abnormalities of the skin. With high definition technology, the resolution of images aids the review and diagnosis by remote means. A multicenter randomized control trial by Eminovic et al addressed the question of preservation of quality and efficiency by studying whether teledermatologic consultations could reduce unnecessary referrals to dermatologist from general practice physicians. Of the 631 patients enrolled (327 intervention/ 304 control), the dermatologists considered a consultation preventable in 39% of the intervention patients and 18.3% of the control patients. (Table 6) The researchers concluded the use of telemedicine could reduce dermatology consultation visits by 20.7%; so in terms of efficiency, virtual care was deemed better than the traditional care model in this case.³¹ It is important to note that the determination of preventable consultations was defined by five (5) dermatologists,

demonstrating that specialist expertise drove the decision based upon quality and efficacy of patient care.

Table 6: Teledermatologic Consultation and Reduction in Referrals to Dermatologists

Reason	No. (%) of Patients		
	Intervention Group (n=200)	Control Group (n=169)	Total (N=369)
Preventable consultations			
Patient recovering/recovered	40(20.0)	7(4.1)	47(12.7)
GP could treat patient	30(15.0)	21(12.4)	51(13.8)
Patient cannot be treated	4(2.0)	2(1.2)	6(1.6)
Other	4(2.0)	1(0.6)	5(1.4)
Total	78(39.0)	31(18.3)	109(29.5)
Nonpreventable consultations			
Teledermatologic consultation advice incorrect	11(5.5)	NA	NA
Dermatologist required for treatment	87(43.5)	94(55.6)	181(49.1)
Patient request	4(2.0)	16(9.5)	20(5.4)
Other ^a	20(10.0)	28(17.1)	48(13.0)
Total	122(61.0)	138(81.7)	249(67.5)

Abbreviations: GP, general practitioner; NA, not applicable

^aOther reasons for nonpreventable consultations included the need for tests and treatment (10 in both groups); patients needed to be reassured (control group, 4 patients); and the dermatologist indicated that the consultation was not preventable because it was required for the study (intervention group, 4 patients).

Source: Eminović N, de Keizer NF, Wyatt JC, et al. Teledermatologic Consultation and Reduction in Referrals to Dermatologists: A Cluster Randomized Controlled Trial. *Arch Dermatol.* 2009;145(5):558-564.

Summary of Findings: The findings of the literature review, while not robust, are encouraging as to the potential impact virtual physician care can provide while maintaining a comparable quality level with traditional face to face care. This lack of robustness makes it difficult to highlight existing research alone as a platform from which to champion virtual care. On the other hand, these findings are encouraging and sufficient to pursue the thoughtful exploration of the steps necessary to accelerate virtual physician care. Institutions working to implement virtual care into operations to care for patients should strongly consider participating in research trials to further document the

effectiveness of this health care delivery model in different settings and contribute to the rather scarce literature.

Aim 2: What are the barriers to the adoption of virtual physician care?

The results of this literature review provided valuable foundational information to help frame the discussions with the key informant interviewees on the acceleration of virtual physician care. Understanding the current research on barriers to adoption provided objective information by which to approach the research to accelerate its use. These findings informed the structure, format, content, and administration of the key informant interview questions developed for Aim 3 of this dissertation.

The systematic review identified fifty seven (57) initial articles of interest. (Table 7) All 57 articles were partially reviewed by reading each abstract and applying the exclusion criteria. Of the 57, seventeen (17) were excluded because they did not meet the criteria of virtual physician care as defined by the use of a technology to visualize and care for a patient in lieu of an in person interaction. (Appendix G)

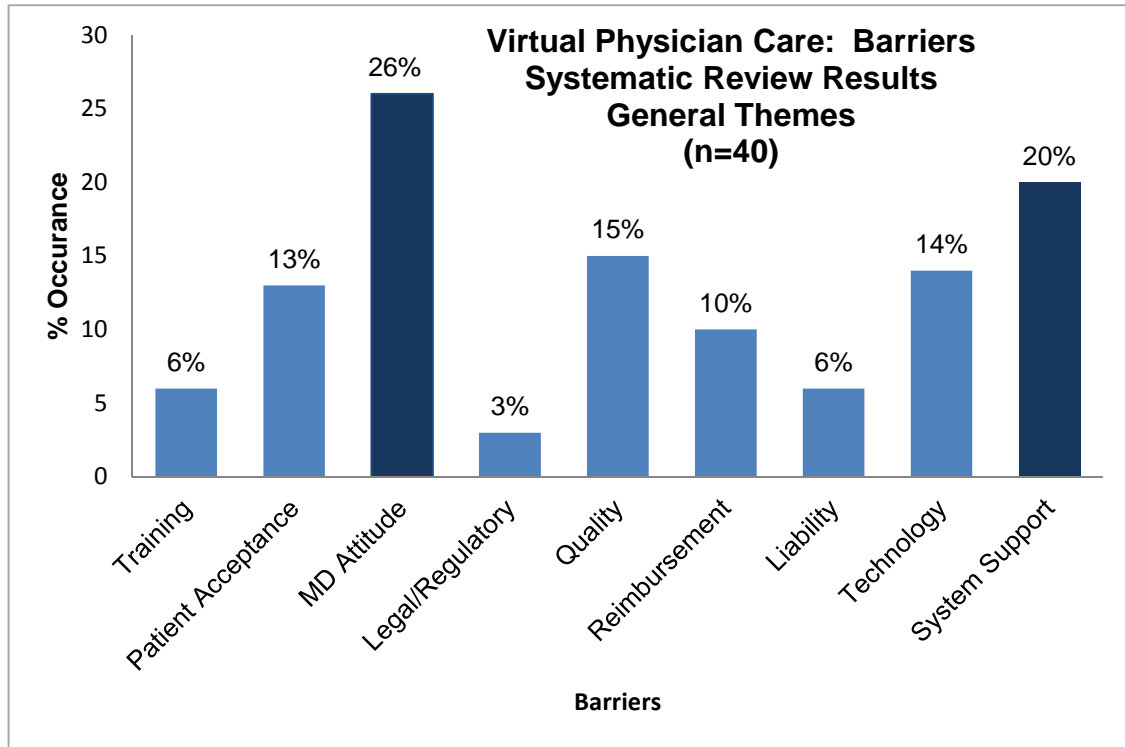
Table 7: Barriers Systematic Review Results: Exclusion/ Inclusion Summary

Included: Virtual Care included patient	40
Excluded: Virtual Care did not include patient	17
Total Articles:	57

Of the 40 articles selected for full review, critical information from each article was abstracted. The results of the review revealed nine (9) general themes summarized below, with physician attitude and system, accounting for over 40% of the barriers. The themes emerged after reviewing all articles and identifying key words described in

research findings as key contributors to lack of adoption of virtual care. These key words were noted during the literature review and summarized in general themes. While some articles mentioned several barriers, the authors generally highlighted the participant's stated major barriers. (Figure 8)

Figure 8: Systematic Review Results on Barriers: General Themes



Themes are summarized in the chart below with accompanying examples of each for clarity and ease of understanding. (Table 8)

Table 8: Barriers Systematic Review Results: Exemplar Examples

<i>Barrier</i>	<i>Exemplar Examples from Literature Review</i>
Training	Stronge et al conducted research on human factor elements in the adoption of telemedicine and determined insufficient training as one of several key impediments to its increased use and acceptance. ³²
Patient Acceptance	Siwicki reported that Dr. Balch, director of telemedicine at East Carolina University stated issues of concern care provided by telemedicine technology is perceived as cold and impersonal. ³³
Physician Attitude	Barton et al. reported that more physician nonusers hold the opinion that colleagues influence their use of new technologies such as telemedicine (p<0.0001) and that more research on telemedicine is needed (p<0.0001). ³⁴
Legal/Regulatory	A higher proportion of nonusers believed that credentialing and licensure issues discourage telemedicine use (33.7% vs. 70.4%, OR= 0.21, CI= 0.15-0.31, p<0.0001). ³⁵
Quality	Research by Barton et al concluded only about one-third of respondents (32%) stated that they could conduct a thorough physical exam of the patient using telemedicine. Additionally, two thirds (66%) reported that they found telemedicine more acceptable for rendering second opinions or offering informal consultations, not for diagnosing new patients. ³⁶
Liability	Siwicki reported that Gordon Rudd, a technologist, stated “When I explain telemedicine, a doctor’s first questions always are, “Do I suffer any additional liability?” ³⁷
Reimbursement	Barton et al. reported that only about one quarter (26%) of respondents agreed that Medicare reimbursement for telemedicine usage was adequate for their level of participation. ³⁸
Technology	Stronge et al. determined that usable software will always be critical for health professionals whose attention is focused on patients and time constraints, rather than software interfaces. ³⁹
System Support	Barton et al. stated that there are other factors to consider in the motivation of a physician participating in telemedicine which includes the location and convenience of the equipment, its availability and ease of scheduling, the age of the equipment, availability of technical support, and other factors that influence a physician’s time expenditure. ⁴⁰

The literature did not identify many studies from 2006 to 2011, with less than 50% (19 of 40) of the articles published since 2006. (Figure 9) Of those published, the barriers

identified were relatively consistent over the course of the fifteen years reviewed. Three identified barriers were particularly consistent; physician attitude, system support, and quality accounting for 61% of the general themes identified in the literature review. (Figure 10)

Figure 9: Barriers Systematic Review Results: Research Studies Publication Dates

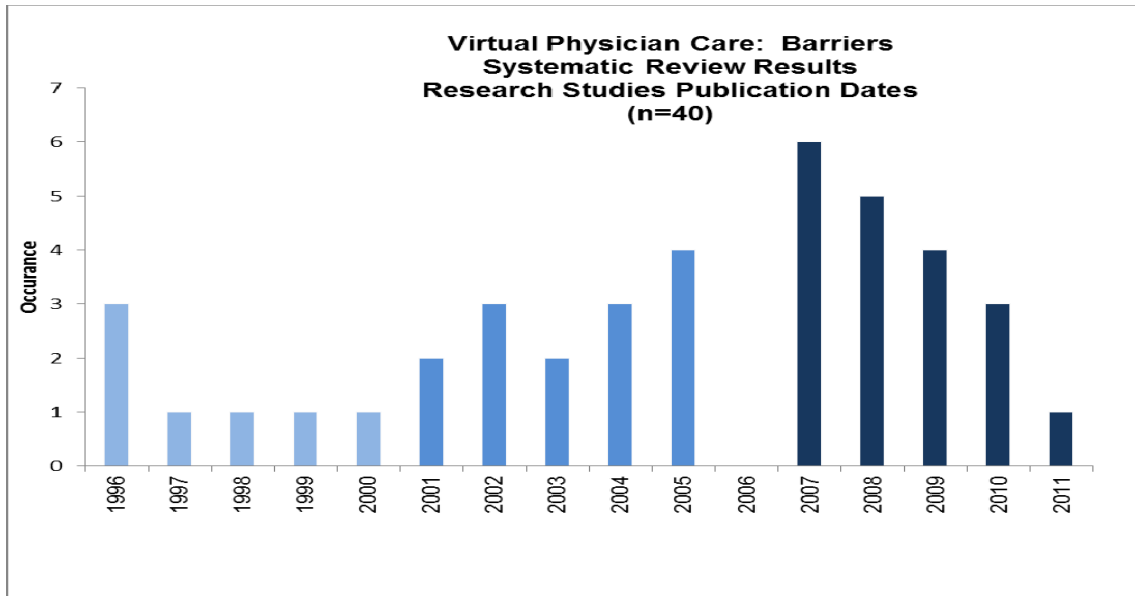
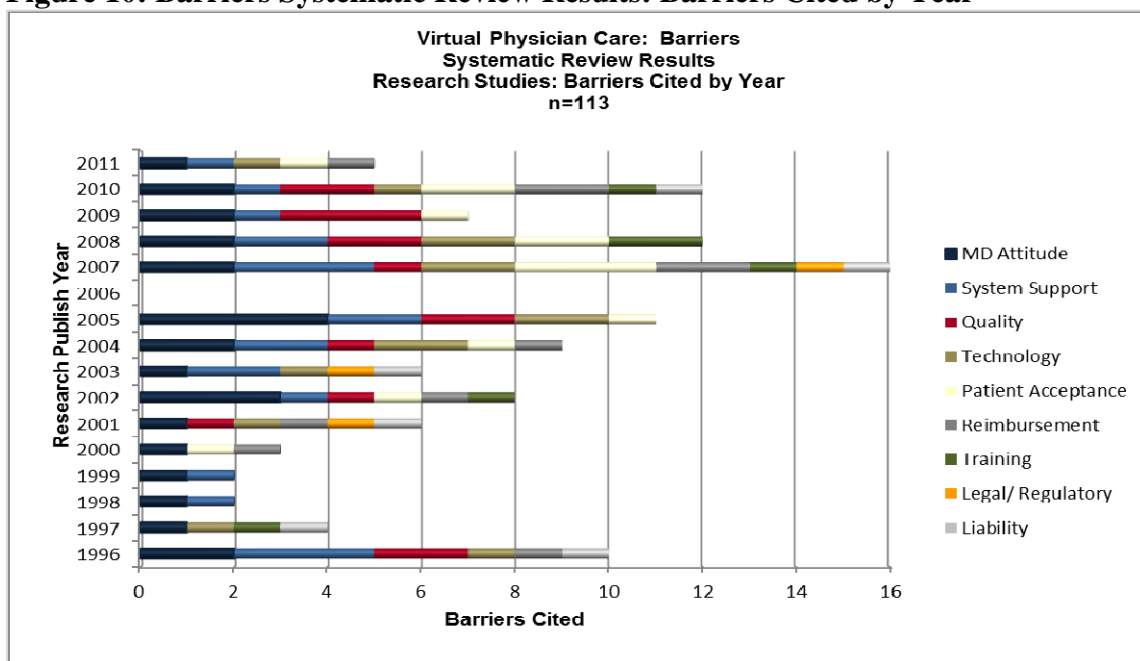


Figure 10: Barriers Systematic Review Results: Barriers Cited by Year



Since technology is changing so rapidly, it would be advantageous to see if its progress will help to minimize barriers in the area of technology. An article published in May 2012 by Health IT News reports a rapid advancement in technology with respect to 4G networks, which could rapidly expand virtual care access in rural areas.⁴¹ The cost of technology is also declining, which may address the barrier of the cost of entry with technology to provide virtual care. Research by Lawrence suggests the cost of technology for in-home monitoring is rapidly dropping, and patients will begin to play a greater role in managing their own care. In addition, the U.S. Government's pledge to increase the national health care IT network infrastructure means that rural areas may have better, faster connections to link with specialty services in the cities, and the use of telemedicine for specialty services like telepsychiatry, telestroke and wound care may increase as a result.⁴²

In the areas of reimbursement, liability and regulatory, there are variable laws by state. Under the Medicare Conditions of Participation, virtual care is a covered service under certain circumstances.⁴³ Specifically, Part B will cover the following services provided using telecommunications:

- initial and follow-up inpatient telehealth consultations (see below for restrictions);
- office or other outpatient visits;
- individual psychotherapy and health/behavior assessment and intervention;
- pharmacologic management;
- psychiatric diagnostic interview examinations;
- ESRD (there are additional requirements for this service);
- individual medical nutrition therapy;
- neurobehavioral status exams;

For these services, CMS requires that the patient be located at a site that is either in a rural HPSA or in a county outside of a Metropolitan Statistical Area. In addition, Medicare requires that the physician be licensed in the state of practice, and that the patient be present for the visit; if the patient is not physically present at the virtual care visit, the physician cannot bill for the consult. The remote physician is considered to be the physician in charge of the patient.⁴⁴

Virtual care also poses obligations and concerns for hospitals and health care systems. Security safeguards must be put in place to ensure secure access and to protect patient privacy while the telecommunications take place. Hospitals need to consider how they would defend claims by a physician that his/her harm to the patient was due to a failure in the telecommunications or access provided by the hospital or system. Medical record documentation must also be addressed, including how to give secure access to the electronic medical records and verify proper documentation. Finally, hospitals should consider how to respond if on-site medical care is necessary and the telecommuting physician is not available.

The Centers for Medicare and Medicaid (CMS) released rules (effective 7/2/11) to streamline the process that Medicare-participating hospitals partnering to deliver telemedicine services use to grant medical staff privileges to telemedicine physicians. Referred to as Privilege by Proxy, it allows for the sharing of credentialing information between hospitals to minimize duplication of work for providers recognized to provide virtual care.⁴⁵

Summary of Findings: The research exploring the barriers to virtual physician care identified nine (9) general themes as contributors to the lack of its adoption. Of the nine, four were mentioned most frequently including physician attitude, system support, technology reliability and quality concerns. Physicians were reluctant to advocate for the use of virtual physician care, lacking confidence in the reliability of the technology and the infrastructure to support it to actually care for the patient. The inability to measure quality consistently also contributed to the overall lack of physician support. The findings did not vary over time, highlighting the need for purposeful research to understand not just what the barriers are, but what can be done to get past them.

The detail in this literature review helped not only frame the key information interview question structure, but also provided me as the interviewer concrete research to refer to and use as prompts during the interviews. Citing the research versus relying on my own experience in building a virtual care network helped to minimize bias.

Aim 3: How can the adoption of virtual care be accelerated?

A total of fifteen (15) key informant interviews, were conducted during the summer of 2012 to explore best practices to accelerate the use of virtual physician. All key informants were employed by CHS, the second largest public healthcare system in the country. (Table 9) This point is important to set a relative context to the findings contained herein: CHS has a level of experience, investment, engagement and access to a population profile which surpasses a majority of health systems in the United States, creating an environment conducive to accelerating the use of virtual physician care.

Furthermore, the physicians identified are in leadership roles, have diverse training, and variable tenure with in CHS. The profile of the interviewees is as follows:

Table 9: Key Informant Interview Profile

<u>Specialty/ Service Line</u>	<u>Tenure at CHS</u>	<u>Provision of Virtual Care*</u>
Anesthesiology	3.5 yrs	Used > 10 times
Cardiology	24 yrs	Never used
Critical Care	16 yrs	Never used
Critical Care/ Palliative Care	2.5 yrs	Never used
Emergency Medicine	4 yrs	Never used
Family Medicine	2 yrs	Never used
Family Medicine	25 yrs	Never used
Family Medicine	14 yrs	Used 1 to 10 times
General Surgery	34 yrs	Never used
Internal Medicine	45 yrs	Never used
Internal Medicine	8 months	Never used
Internal Medicine / Hospitalist	15 yrs	Used 1 to 10 times
Neurology	6 yrs	Used > 10 times
Neurosurgery	16 yrs	Never used
Oncology	15 months	Never used

* Using video technology to care for a patient in lieu of face to face interaction

While each physician leader may not have had direct experience with virtual care, all were effective in describing it and expressing their understanding of its definition for purposes of this research. This is not surprising that the profile of the interviewees reflects such low exposure to actual use of virtual physician care as it has not yet been widely adopted in practice or in residency training programs. It is also recognized those without actual experience with virtual care have a knowledge base different from that of a physician who may have experience providing virtual care. From a leadership perspective, often the leader is not the content expert but is still called upon to help champion effective change. This provides the context for the informants to describe their opinions and role in acceleration of virtual physician care, regardless of their experience.

Coding

All fifteen interviews were reviewed separately by three researchers, including the author, to synthesize results and identify codes. Inter-rater reliability (IRR) was determined using joint probability of agreement with IRR ranging from 90.48% to 95.28%. (Table 10) The highlighted boxes represent the absence of a code identified by another coder.

Table 10: Key Informant Interview Coding: Inter-Rater Reliability

Acceleration of Virtual Physician Care			
Key Informant Interview Coding			
Inter-Rater Reliability			
Joint Probability of Agreement			
	Coder 1	Coder 2	Coder 3
1	Effective Technology	Effective Technology	Effective Technology
2	Continuity of Care	Continuity of Care	
3	PCP Shortage	PCP Shortage	PCP Shortage
4	Training	Training	Training
5	Quality	Quality	Quality
6	Education	Education	Education
7	Reimbursement	Reimbursement	Reimbursement
8	Liability	Liability	Liability
9	Incentives	Incentives	Incentives
10	Institutional Support	System Support	Institutional support
11	Specialist Shortage	Specialist Shortage	Specialist Shortage
12	Availability/ Access	Availability/ Scheduling	Availability/ Access
13	Physician Champion	Physician Champion/ Big wins	Physician Champion
14	Patient Acceptance	Patient Acceptance	Patient Acceptance
15	Efficiency	Efficiency	Efficiency
16	Team Approach	Team Approach	Teamwork
17	Loss of Human Touch	Empathy/Loss of Human Touch	Loss of Human Touch
18	Appropriate Resources	Resources	Appropriate Resources
19	Demand	Needs/ Demand	Demand
20	Costs	Costs	Costs
21	Multiservice Location		Multiservice Location
	Inter-Rater Reliability: 1,2 & 3	90.48%	
	Inter-Rater Reliability: 1 & 2	95.24%	
	Inter-Rater Reliability: 1 & 3	95.24%	
	Inter-Rater Reliability: 2 & 3	90.48%	

Themes

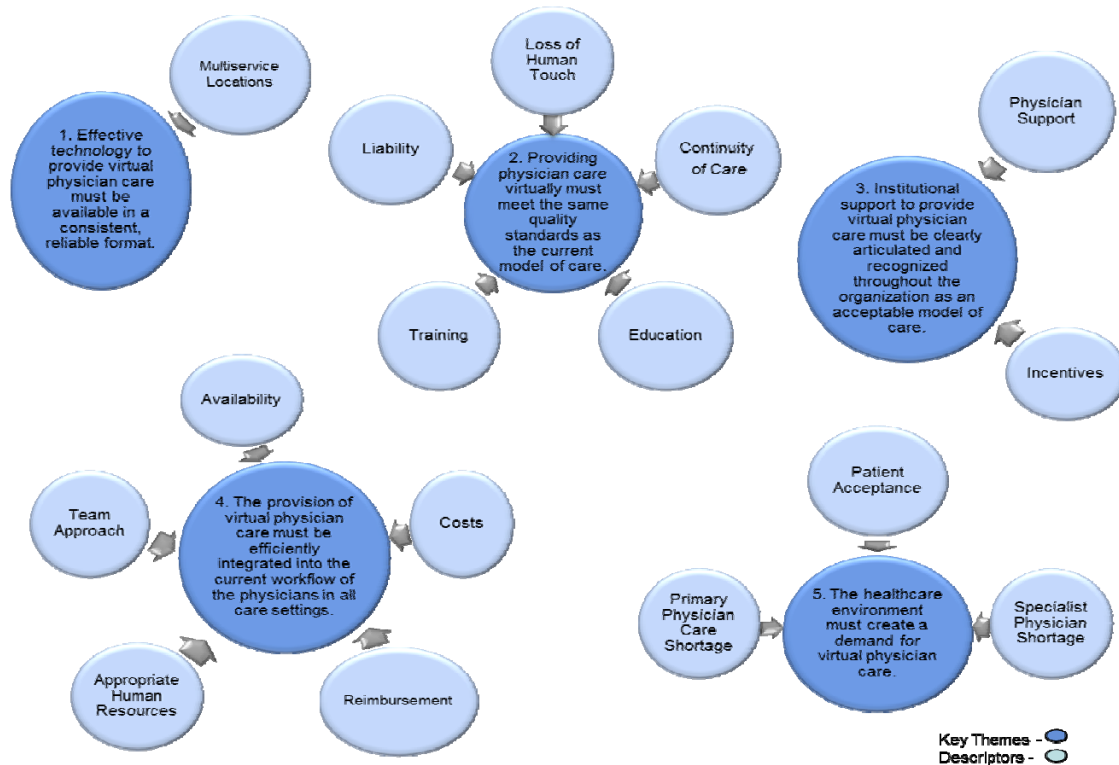
Upon further review and analysis, codes that were mentioned consistently and discussed in detail during the interviews were characterized as key themes. Five key themes emerged to suggest factors that may accelerate the use of virtual physician care. Although the key informants represented a wide variety of medical training and tenure, there was a great deal of consistency in the ideas expressed by all to identify the five key themes. (Table 11)

Table 11: Key Themes from Key Informant Interviews to Accelerate the Use of Virtual Physician Care

Themes
1. Effective technology to provide virtual physician care must be available in a consistent, reliable format.
2. Providing physician care virtually must meet the same quality standards as the current model of care.
3. Institutional support to provide virtual physician care must be clearly articulated and recognized throughout the organization as an acceptable model of care.
4. The provision of virtual physician care must be efficiently integrated into the current workflow of the physicians in all care settings.
5. The healthcare environment must create a demand for virtual physician care.

After evaluation of the data based on the themes, it was assessed in relation to the overall research objective: How can virtual physician care be accelerated? While the themes emerged, the remaining codes offered more detailed descriptions of the themes as relayed by the interviewees. (Figure 11) The descriptors are included, along with illustrative comments by the interview subjects, within each theme, to address the research question.

Figure 11: Key Informant Interview Coding Results: Themes and Descriptors



Theme # 1: Effective technology to provide virtual physician care must be available in a consistent, reliable format.

Overwhelmingly, the first response by almost all key informants addressed the ease of use, reliability, and consistency of the technology to provide virtual physician care. The responses focused not only on their ability as clinicians to access the technology to provide virtual care, but also on the ability for the patients or care providers on the receiving end to access the technology as well. The refined descriptor included the ability of the technology to be used in multiservice locations (not just traditional healthcare settings). Perhaps stated best by a key informant:

“A proof written technology around it, hardware, software, excellent audio and video connections that are not cumbersome to work with, that work well on both ends so that the physician sitting in the block has high quality audio video at their disposal, and also on the receiving end. It needs to be user friendly on both ends, so that the physician providing the care, or whatever the care provider is, and the patient, and the staff receiving the care, are both comfortable with the technology.”

Another key informant noted, *“ I think making it easy for the end users, easy for the doctors to use, easy for hospitals to implement, easy for people to control. The challenges we saw in a small way in Georgia was that it relied heavily upon equipment that was in one room and the patients had to be transported to that room.”*

Furthermore, it was noted the advances in technology should lend itself to a model with multiservice locations, including the patients’ homes. One key informant made a relevant example of the role Walmart may play in the future of primary care and its potential impact on illness prevention and health maintenance.

“Only half joking, some of my family medicine colleagues think the future of primary care is Walmart. Walmart is a great example of just one of many; it’s ubiquitous, they are everywhere, they are open 24 hours a day, they already have a pharmacy, they already do blood pressure checks, and I think a whole lot of what’s missing in American healthcare now is a focus on health maintenance and help in illness prevention. So my thought would be you have a trained practitioner who maybe manages a series of these local units (Walmart, Target), and the physician would be readily available by telemetry link and telemedicine.”

Another important component expressed in this next informant quote was the ability to review the patient medical record or images through some means such as an electronic medical record (EMR). While the ensuring access to broadband networks and high quality images was important, some interviewees spoke more broadly about effective technology by referencing the availability of information about the patient to further enhance virtual physician care. Much of this is already available to clinicians now, but it’s worth noting its application under the effective technology theme and its

compliment of virtual physician care. This availability of images and information, if used appropriately, could help prevent patients from having to travel to see specialists unnecessarily.

“A patient knows they have cancer. They need to see a specialty and the issue is mostly about the evaluation of films and making recommendations about various treatment strategies, but they may live hours away; absolutely the ideal way to do it (virtual physician care), as long as the high quality images could be reviewed.”

Theme # 2: Providing physician care virtually must meet the same quality standards as the current model of care.

The importance of the quality of virtual physician care was mentioned in every interview, but not in a way that was negative or described by the informants as a barrier. Rather, they readily shared areas where virtual physician care could be implemented without major concern for its quality, if provided with the right infrastructure, equipment, and system support. Efficacy meaning it meets the current standards of care provided in the traditional face to face model of care. Five descriptors for this theme were identified including loss of human touch, continuity of care, education, training, and liability.

Many of the physicians acknowledged the loss of human contact and the art of the medical profession which comes with the interpersonal connection between physician and patient. Therefore, throughout the key informant interviews, virtual physician care was almost always described as an additional tool to care for patients, preserving and enhancing continuity of care, not as a replacement of the physician/ patient relationship.

“That’s one of my biggest concerns, is that sense of remoteness which is positive in some ways, but also remoteness in a negative way that means loss of touch. In some ways, there’s kind of no substitute for being there, even though we are trying to help people be there virtually.”

“If you know the patient well, a picture would be fine. If you have never seen the patient before, I think most doctors would say I’m a little worried about not being able to lay eyes on the patient directly and to touch the patient directly.”

Another interviewee described it in a slightly different way, bringing up the change in human contact, but expressing optimism if it is implemented appropriately.

“I’m not as worried about the lack of human contact that comes with this. I think if it’s utilized in the correct fashion and has the human contact on the other end this is just a service that is being added to something that is already in place, I think that concern that people have expressed is probably not one that we really need to worry about as long as we work at that intentionally, that human contact doesn’t go away.”

Yet another key informant viewed virtual care from the competitive landscape, referring to several for-profit companies establishing virtual urgent cares where patients can log onto a website, enter their own health information, and receive an instantaneous virtual physician visit. This model did not sit well with informants, referencing a lack of connection to a medical home or valid health information as described with limited or no access to the patient medical record.

“I mean, how much money could you make having a bunch of shops all over the place and being the doctor, but not providing the high quality.”

These exemplary quotes dovetail nicely into the second descriptor identified under the quality theme: continuity of care. The interviewees shared the opinion that virtual care is an enhancement to the physician patient relationship, not a replacement. The use of virtual care can actually enhance not only access to the patient as one interviewee describes, but also the relationship between primary care providers and specialists, as another informant shared.

“So if we had other ways of ‘ “bringing people into the office” ’ or giving them access after-hours, during hours, I think it would be huge. It would improve quality, it would improve overall outcomes for patients and decrease costs.”

“We need to build a virtual care component into whatever the care team’s doing.”
“I think having a virtual care program that ties everyone together, and creates instant access to all the specialties for the primary care doctors, for a lot of specialists it would create relationships back to the primary care doctors. I think for everyone it will be a means to understand how to grow their practices so this would be some sort of common theme that people could unite behind.”

The descriptors of education and training were addressed from both the physician, clinician, and patient perspective. While the expectation of efficient technology addressed in theme #1 includes ease of use, there was the recognition that training and education must be addressed so virtual care is utilized effectively. This includes pre-training for clinicians not only in the use of technology, but also on the soft sides of interacting with patients and other care givers from a distance. Similar education and training was also deemed necessary for patients, so they are aware of the technology requirements (i.e., broadband, 4G access) as well as what to expect when they interact with their caregiver in a virtual manner. As important is the backup plan if the virtual platform doesn’t work; safety for all involved must be addressed prior to program implementation.

“What you need to do to make that kind of virtual care work is the primary care doctors who may be interfacing with patients or the emergency medicine doctors or whomever they are interfacing with have to have received some extra training.”

“We gotta make sure that we do it right; this can’t be something you just sort of haphazardly do. It has to be something where there is complete structure around it and everyone knows their roles and expectations. There is a safety mechanism put into place so if something is not going right or if something needs to be deviated from.”

Finally, the issue of liability surfaced enough to mention under the quality theme. In order for a physician to be liable to a patient for malpractice, the requisite relationship

must first exist. Typically, the physician/patient relationship begins when the patient consents (whether express or implied) that the physician may provide treatment. Other signs of a physician/patient relationship include whether the physician expects to be paid or bills for her/his services, whether s/he has reviewed and/or recorded information in the medical record, and whether s/he controlled (or knew that their opinion would control) the patient's care. For those physicians treating a patient through telemedicine, these requirements would also have to be met and, consequently, they would have the requisite physician/patient relationship.

Once the physician/patient relationship is established, the concern is whether the physician also met the prevailing standard of care. While most standards of care are now national, there could be situations where telemedicine creates a disparity. For example, the physician may be in a location where the standard of care is different than the standard where the patient is located, thereby creating the question of whether the physician was negligent for following a different standard. This evaluation will need to be made on a case by case basis.

The informants did not express concern about liability, but did talk about its recognition by the state and national medical boards and the status of their current liability coverage and virtual physician care. The conversation also related to institutional support, which is covered in theme #3; if administrative staff, physicians, and, in turn, regulators endorsed the provision of virtual care, the associated physician liability coverage would include recognition and coverage amounts equal to that of the current model of care.

“I think a comfort level that it’s okay, that there is no more liability there than in any other situation.”

Theme # 3: Institutional support to provide virtual physician care must be clearly articulated and recognized throughout the organization as an acceptable model of care.

Although the physicians interviewed did not seem to view the quality of virtual physician care as a major concern in its acceleration when used in appropriate circumstances, there was considerable amount of conversation about the institutional support for the provision of virtual care. Relating back to the literature review on barriers, this closely correlated to system support and physician attitude. It could also be implied that the acceleration of virtual physician care requires the leadership component of change management and the creation of an environment where innovation and the trial of new models is cultivated. There were two descriptors identified in this area including physician support and incentives.

The need for institutional support was expressed many times, in terms of functionality of virtual care which will be described more in theme #4, and in understanding how its use impacts the current workflow, quality, payment model, relative value unit (RVU) production, and role of the physician in a care team. As with any new model of care, as described in the introduction of this dissertation such as hospitalist services or increased use of mid-level providers, there is a fundamental shift in the process which support the patient care. Although not characterized as bad or good, the interviewees expressed the importance of administration acknowledging recognizing the

requisite learning curve, process impact, and new dynamics that the introduction of virtual care is sure to impress upon the infrastructure of the system.

“I think it makes it easy for us to go out there when we can tell them that we have the system support for this. It’s administratively supported at a high level at this point that they know this is an investment in a direction they want to go.”

“We need to create an environment for the adoption of many things, including telehealth.”

Furthermore, the informants recommended physician leadership as a key component to the acceleration of virtual physician care. This is not just a physician leader for each different medical or surgical specialty field willing to become familiar with its application, but an overall champion in the system for virtual physician care with actual experience caring for patients with virtual care. When reviewing the attributes of the key informants, it is of interest to note only two had significant experience taking care of patients virtually.

“I think you do need champions to push it forward at CHS.”

“This hinges on another issue which is: do physician leaders in the system continue to provide patient care? I think it’s very valuable if we start to do this ourselves and then we can go to other physicians that are providing service everyday and say I’ve tried this out and it works.”

“The other thing that might help is if we had a physician leader here who dropped in and had significant experience in this area, and was a true believer.”

Finally, the need for incentives, either financial or protected time to trial new care models, was expressed as an accelerator of virtual physician care. Physicians may believe in virtual care, but the interviewees expressed the importance of the right culture and

recognition in place to set the stage to try a new technology and create care pathways to serve patients.

“You know, when you adapt a new tool you have to slow down, you have to drop other things, and think how do we implement this tool in our current work environment?”

Theme # 4: The provision of virtual physician care must be efficiently integrated into the current workflow of the physicians in all care settings.

The theme of efficiency produced a robust amount of commentary and quotes from the key informant interviews as it related to the actual logistics and implementation of virtual care as a viable tool to provide care to their patients. Respondents made suggestions on how to address the logistics and issues identified so the use of virtual care can be accelerated. Therefore, the results have provided meaningful feedback as to how to accelerate virtual physician care in practice. The five descriptors identified include availability, reimbursement, cost, appropriate human resources, and team approach.

A physician’s use of time is very important as it dictates the use of their skills, availability to serve their patients (access) and may be directly correlated to their revenue production. Integrating the use of virtual physician care into the schedule so it is available to provide service is vital to balance efficiency, reimbursement, and access.

“Specifically within the traditional physician’s offices, the walls can only expand so far; how do you get more patients through your practice within a given day? How do you give a pointed evaluation when it’s needed without it interfering with everybody’s schedule? I think it allows a doctor to perform an evaluation from wherever they choose to be, or need to be on, a patient that happens to be anywhere, or whether it is in a doctor’s office or even at home.”

Currently, the provision of virtual physician care has variable reimbursement across the country and the world. During the key informant interviews, the physicians were aware of reimbursement issues associated with providing care virtually, and some stated acceptable reimbursement policies might help its acceleration. However, current uncertainty about reimbursement did not hinder conversations about use and implementation. Informants expressed opinions supporting virtual physician care as a more efficient and cost-effective means of care for some patients. Providers in both the primary care and specialty areas did not relay concerns with loss of demand for their service, but rather seemed interested in ways to streamline those who were over-utilizing physician services or could access care coordinated on behalf of their physicians in a more effective manner. Hence, the theme of efficiency and the descriptor of reimbursement found a balance of payment for services as a recognized mode of care along with an increasingly efficient care pathway to extend the supply of physicians and clinicians to serve individuals and populations.

“The cost curve in this whole volume vs. value issue and how do we get reimbursed for the time that physicians spend. So it may improve patient satisfaction, it may help with access issues, it may improve quality of care, but if we’re not necessarily valuing that in terms of revenue to the physicians, then it is also going to be a difficult shift to make.”

The category of cost was discussed by some of the key informants as they questioned whether or not the provision of virtual physician care was more cost-effective and efficient than then the traditional model, especially in light of the reimbursement variability discussed in the prior paragraph.

“I think a big danger is we are going leap into this as we have many times with medicine when we really don’t have a good evidence base that this change will either improve quality or save money.”

“So if we had ways of bringing people into the office or giving access after hours, I think it would be huge. It would improve quality; it would improve overall outcomes for patients, and decrease costs.”

“You know one could argue even if we can’t get paid for it, you know, there is a cost to it, right; so you have to pay for the cost and so the question is, I would even push and say even if we can’t get paid at the present moment, should we take on the cost and should this be a loss leader?”

An important category issue raised was the need for appropriate human resource support to provide virtual care, including the clinical manpower by which to extend this service. Many of the interviewees discussed the potential of using the mechanism of virtual physician care with a care team to more effectively partner with people in their care. The literature review in Aim 1 on quality highlighted some of the areas where increased interaction with a patient led to better outcomes. The informants tended to agree with this, but expressed that the current work environment has very little room to facilitate additional patient access. Hence, the incorporation of virtual care needs to be considered not just from the first three themes- efficient technology, quality, and institutional organizational support- but also from the standpoint of offering whether the institution can provide appropriate resources.

“Something has to give, the model of growing and physicians at all these small hospitals, it’s not financially viable long term. So every care model which brings efficiency while maintaining high quality, be it advanced practitioner usage or nurses or virtual care models, that is what we are describing here.”

“My philosophy would be that progressively patients are going to understand they don’t necessarily need to see an MD or a DO, that they can see care extenders and again, candidly those can be trained nurses, nurse practitioners, physician’s assistants, that can extend care out to the place where people live and work.”

Finally, the provision of appropriate resources and how best to work together as a team to provide virtual care was discussed. As medicine is undergoing a transformation from physicians working as isolated entities to a more consolidated, team approach, the comments by the informants reflected how important it is for virtual care to be viewed as a team effort and not simply effort of the physician. Quotes referenced below clarified the understanding that this way of caring for patients will impact everyone across the care continuum and all clinical functions. Interviewees identified specific areas, such as mid-level providers using virtual care, which may find a niche where they are more effective, in both cost and service, with helping patients comply with their medical plan than physicians. The prevalence of comments surrounding a team approach to virtual physician care was encouraging to report on reflecting the physician's understanding of the potential impact of virtual physician care on others.

"I think having a virtual care program that ties everyone together, and creates instant access to all the specialties for the primary care doctors, for a lot of specialists it would create relationships back to the primary care doctors. I think for everyone it will be a means to understand how to grow their practices so this would be some sort of common theme that people could unite behind."

"In primary care there would have to be a strong relationship between the advanced practitioner and the primary care physician back home."

Theme # 5: The healthcare environment must create a demand for virtual physician care.

The final theme identified demand for services as key to accelerating the use of virtual physician care. The interviewees referenced the dynamic of the healthcare industry's provider shortages along with patient acceptance of being cared for virtually as a necessary piece of the puzzle. Three descriptors were associated with this theme, including primary care shortage, specialist shortage, and patient acceptance.

In the first two descriptors, most participants stated the fact that there are current provider shortages, both in primary care and specialty services. Some informants explored the possibility of geographic areas where there is not a shortage of providers, but rather an unequal distribution of providers, making it problematic to serve the population appropriately. Many mentioned rural areas, in particular, without access to specialty services.

“We also don’t have sufficient physicians to be able necessarily to go through the nuances of experience by a family, so sometimes it would make sense to have a virtual consultation or alternatively group medicine consultation with a whole family or sets of families that share a common problem.”

“Situations where expertise is needed that is not available locally and it’s going to be situations where you need a specialist and in many cases a sub-specialist, to assist with the care of a patient in a community where it doesn’t exist.”

‘We have a lot of issues with access and primary care, and the access issues could be overcome with virtual care.’

Finally, there was conversation about patient acceptance and the perspective of the end user’s willingness to be cared for by a physician virtually instead of a traditional face to face manner. Many suggested targeted marketing campaigns, after the virtual care infrastructure is established and tested, to help educate populations about the safety and efficacy of virtual physician care. This in some way relates to a more broad based approach by the healthcare system to support virtual physician care and touches on the category of education brought up in the quality theme, identifying the need for an educated physician. In this case, however, it’s clear that an educated patient is also necessary in the care process.

‘If there was some way to get in that kind of marketing space (viral), making it cool, making it easy for people, and then some sort of viral catch, where people could get on.’

“You have to show results, even if it’s small, you know 30 or 50 patients, show that this did something.”

“I would do a marketing campaign at the hospital and a marketing campaign in the community; what a great service CHS is bringing into your system, or to your community and I think that will change the perception.”

Summary of Findings: The results of the key informant interviews identified five themes that must be appropriately addressed to accelerate the use of virtual physician care.

1. Effective technology to provide virtual physician care must be available in a consistent, reliable format.
2. Providing physician care virtually must meet the same quality standards as the current model of care.
3. Institutional support to provide virtual physician care must be clearly articulated and recognized throughout the organization as an acceptable model of care.
4. The provision of virtual physician care must be efficiently integrated into the current workflow of the physicians in all care settings.
5. The healthcare environment must create a demand for virtual physician care.

Key informants illustrative comments bring to life actionable recommendations for health systems considering provision of virtual physician care. Perhaps one interviewee’s statement provides a summary perspective on acceleration of virtual physician care,

“So, rather than having yet another kite flying exercise without clear definition and without unambiguous support, if we do this, we should do it with the intention of doing it well, becoming national leaders, defining very clear end points; two or three well-defined, well funded pilot projects with adequate support that allows measurement of outcomes. I think if you have those, I, as a leader in my own domain, don’t need anything more than institutional support with the resources I mentioned.”

Chapter V: Plan for Change

In a rapidly changing modern healthcare environment, virtual care is positioned to become a standard application for providing care to patients without compromise of quality. My interest in pursuing this research was to not only build my knowledge base and, in turn, the knowledge base of Carolinas HealthCare System (CHS), but also to expose those in my professional network to the real possibility that virtual care can be thoughtfully integrated into the care model to help serve patients and communities. The potential and, now, reality of healthcare reform creates a timely environment to challenge the traditional practice of healthcare to expand our tools to reach people in health, wellness, and care more effectively and efficiently. The time is now to keep promoting the research and to engage with clinicians and patients to accelerate the use of virtual physician care. A recent article published in Health Leaders Media states it appropriately, reporting that the field of telemedicine is still emerging and, while there's anecdotal evidence of its benefits to care, there have not been a sufficient number of long-term studies to qualify it. Their industry survey of technology leaders reported that 87% of respondents said they have at least one or more telemedicine applications in place now, or will in the next one to five years.⁴⁶ Furthermore, a prominent healthcare strategy group, SG2, published market research extolling the benefits of virtual care, citing rewards for the patient, provider, and health system. (Table 12) As this care platform gains traction as a market differentiator and soon a standard operating platform in the

healthcare arena, even the most conservative of providers will be forced to look twice at providing medical care by virtual means.

Table 12: SG2: Current Market Needs Offer a Telehealth Value Proposition to All Stakeholders

Current Market Needs Offer a Telehealth Value Proposition to All Stakeholders

Customer—The Group That Pays or Changes Behavior

Customer	Example Needs
Patient	<ul style="list-style-type: none"> ▪ Access: Get fast, convenient access to physician of choice regardless of insurance status ▪ Savings: Reduce out-of-pocket expenses ▪ Health Improvement: Improve quality of life and eliminate errors
Payer	<ul style="list-style-type: none"> ▪ Value: Improve access and quality while reducing reimbursements ▪ Savings: Reduce operating costs ▪ Revenue: Grow employer contracts
Physicians	<ul style="list-style-type: none"> ▪ Revenue: Grow patient volumes and modify case mix ▪ Efficiency: Improve work flow
Hospital	<ul style="list-style-type: none"> ▪ Productivity: Increase revenue from existing staff and assets ▪ Growth: Capture market share and reduce leakage ▪ Quality: Improve outcomes and document results ▪ Savings: Reduce operating costs

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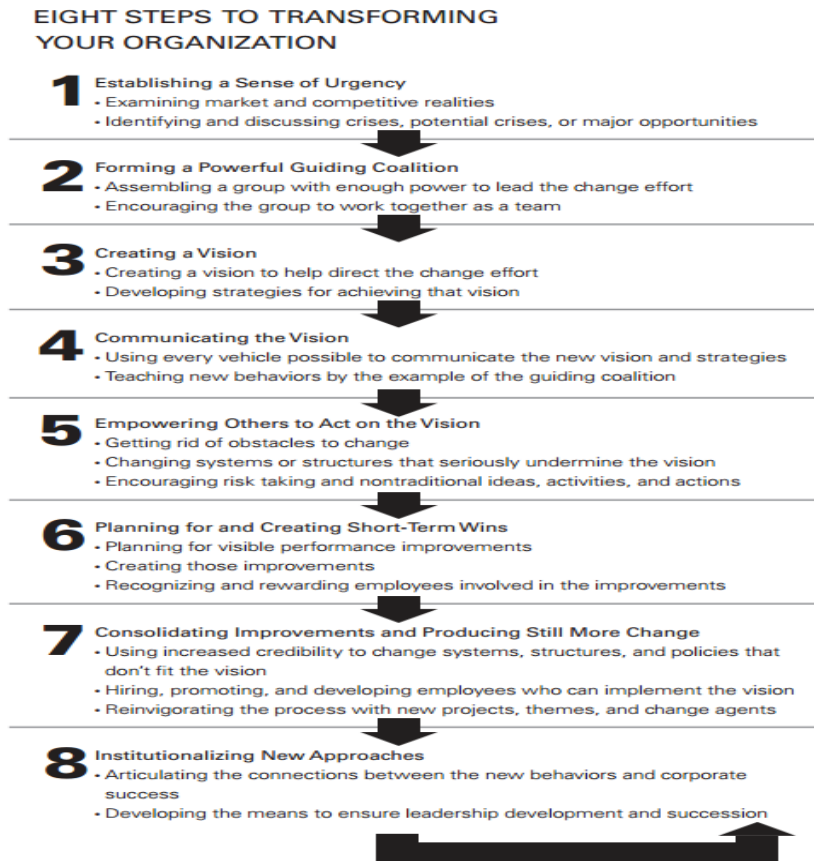
Source: Sg2 Webinar; *TeleHealth: Bridging Care Components to Improve Quality*; Ateret Haselkorn-Consultant, Sg2; March 8, 2012; Slide 24.

The adoption of virtual care has significant implications for public health. There is difficulty across the country and the world with access to appropriate medical services, in both primary and specialty care. This is projected to be even more difficult in America as an increased percentage of the population gains health insurance coverage with health reform implementation in 2014. The training programs for physicians have yet to increase the numbers of slots to keep up with the demand. Alternative means to help provide access to clinicians without increasing supply is a public health issue in need of viable solutions. The acceleration of virtual physician care can be one of those solutions.

In my role at Carolinas HealthCare System, this research conducted provided me useful information about how to develop and implement a plan to successfully integrate virtual physician care as a mainstream model of care. My team and I have been diligent through this entire process to incorporate the findings from the literature reviews and the key informant interviews into the practical application and advancement of virtual physician care. We also know this is only a portion of what is needed to be successful. Change is not easy and change requires leadership. During the past two years, the DrPH curriculum has provided very valuable information not only about public health, but on leadership theory and approach to help implement change effectively. While we are early in our journey, the plan for change has been heavily influenced by the work of John Kotter and Donella Meadows on change management and leveraging points in systems to help ensure the plan for change managed to be as successful as possible.

Kotter's expertise in the area of change management provides a very sound road map to help navigate an often difficult path. He provides eight key insights as to why change efforts fail.⁴⁷ (Table 13)

Table 13: Kotter's Eight Steps to Transforming Your Organization



Source: Kotter, J. P. (1995). Leading Change: Why Transformation Efforts Fail. *Harvard Business Review OnPoint* (March-April), 1-10.

As we developed the plan and associated action steps, Kotter's work was integrated into our efforts as to help mitigate the pitfalls which often cause change efforts to fail. Much of this was accomplished under plan item #1 below, but its influence is reflected throughout the entire plan.

Furthermore, Donella Meadows work on leverage points and places to intervene in a system has proven very powerful as we work to help virtual physician care find its appropriate place in the organization to incubate and grow. (Table 14) Meadows

provides a nice summary in the opening paragraph stating, “Folks who do systems analysis have great belief in leverage points. These are places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can create big changes in everything”.⁴⁸ Within CHS we challenge ourselves to think in terms of Meadows theories and utilize the corporate environment we are in as a series of opportunities to create something new, something better, something different. This was especially powerful when applied to plan item #2 to implement pilots to show the efficacy, quality and efficiency of virtual physician care and create something that can change everything.

Table 14: Meadows Leverage Points – Places to Intervene

Places to Intervene In a System (In Increasing order of effectiveness)	
12	Constants, parameters, numbers (such as subsidies, taxes, standards)
11	The sizes of buffers and other stabilizing stocks, relative to their flows.
10	The structure of material stocks and flows (such as transport networks, population age structures)
9	The lengths of delays, relative to the rate of system change
8	The strength of negative feedback loops, relative to the impacts they are trying to correct against
7	The gain around driving positive feedback loops
6	The structure of information flows (who does and does not have access to what kinds of information)
5	The rules of the system (such as incentives, punishments, constraints)
4	The power to add, change, evolve, or self organize system structure
3	The goals of the system
2	The mindset or paradigm out of which the system-its goals, structure, rules, delays, parameters-arises
1	The power to transcend paradigms

Source: Meadows Donella. Leverage points. Place to intervene in a system. Hartland, VT, USA: The Sustainability Institute; 1999.

Incorporating as many aspects of the DrPH program as possible and the research specific to the acceleration of the use of virtual physician care has culminated in the development of a thoughtful plan for change to help positively influence the world of public health and healthcare to help more people and communities. Our plan for change is simple: Provide a reliable virtual care infrastructure at CHS so the provision of care to patients and communities with this platform becomes common practice, efficiently integrated into the care continuum for all of our patients across our enterprise. At the same time, lead the industry in research on the quality of virtual care as well as effective implementation of it to serve patients and populations. A summary of each plan area and action steps to achieve the change as follows. (Table 15)

Table 15: Acceleration of Virtual Physician Care: Plan and Action Steps for Change

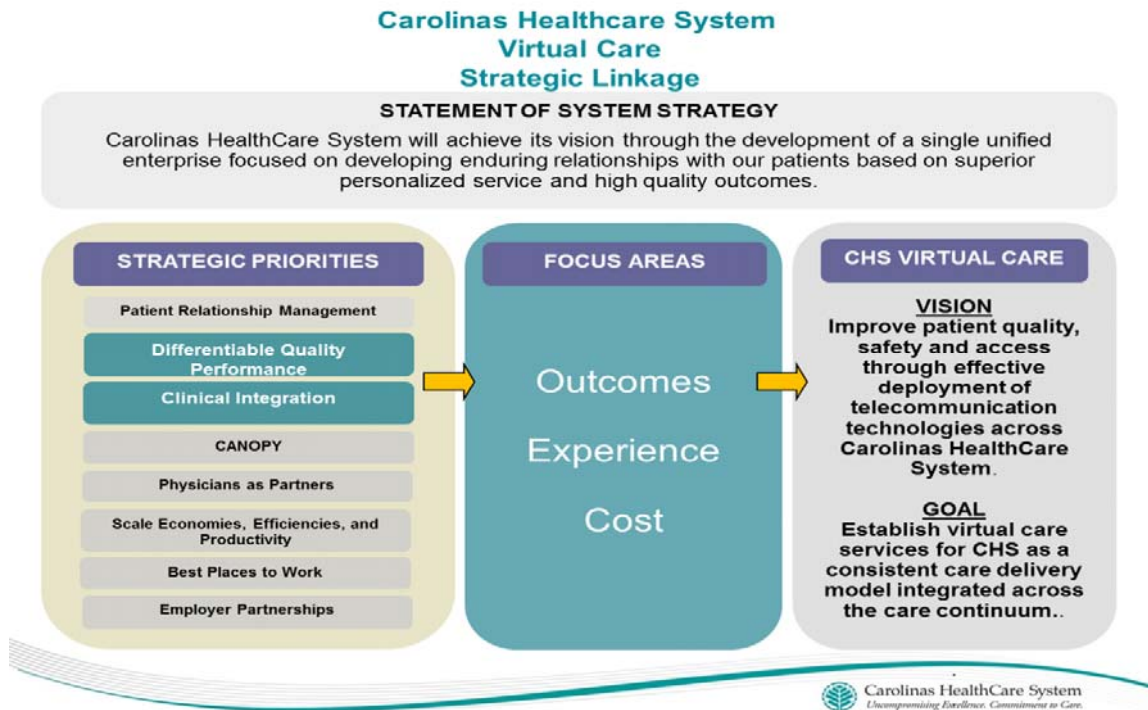
Plan	Link to Research/ DrPH Program Curriculum	Action Steps for Change	Timeline
1. Build infrastructure at CHS to support provision of virtual care enterprise wide	Overall DrPH Program Curriculum Literature Review: Barriers Key Informant Interview: Themes: #1. Efficient Technology #2. Quality #3. Institutional Support #4. Efficiency	1. Establish Virtual Care as a Strategic Priority for CHS 2. Identify Physician/ Administrative Champions 3. Develop Work Plan and Groups to Create Infrastructure 4. Measure Performance/ Reliability	Current
2. Implement virtual physician care pilots at CHS to prove quality, reliability, and efficiency of virtual care platform	Overall DrPH Program Curriculum Key Informant Interview: Themes: #5. Demand	1. Inventory Current virtual Physician Care Work at CHS 2. Identify Need as Clinician or Patient Driven 3. Empower Physician/ Administrative Champions Per Pilot 4. Establish Work Plan 5. Implement 6. Measure Results	Q4 2012
3. Contribute to the virtual care research literature on the quality and utilization of virtual physician care	Literature Review: Quality Key Informant Interview Themes: #2. Quality	1. Integrate Pilot Work and Research 2. Establish Research Team to Join Clinical Integration Team	Q4 2013

		3. Conduct Research (RCT recommended) Publish Results	
4. Position the CHS virtual care program to become a model for the rest of the country	Literature Review: Quality Literature Review: Barriers Key Informant Interview Theme: #1. Efficient Technology #2. Quality #3. Institutional Support #4. Efficiency #5. Demand	1. Establish Successful Virtual Care Model 2. Publish Results of this Research 3. Partner with Other Thought Leaders in Virtual Care 4. Present Nationally on Virtual Physician Care Success and Challenges	2013/2014
5. Explore policy development to advocate for the provision of virtual care in public health and healthcare	Overall DrPH Program Curriculum Literature Review: Quality Literature Review: Barriers Key Informant Interview Theme: #1. Efficient Technology #2. Quality #3. Institutional Support #4. Efficiency #5. Demand	1. Influence Policy in NC/ SC for Recognition of Virtual Care 2. Participate in National Advocacy Work (ATA)	2013/2014

1. Build infrastructure at CHS to support provision of virtual care enterprise-wide

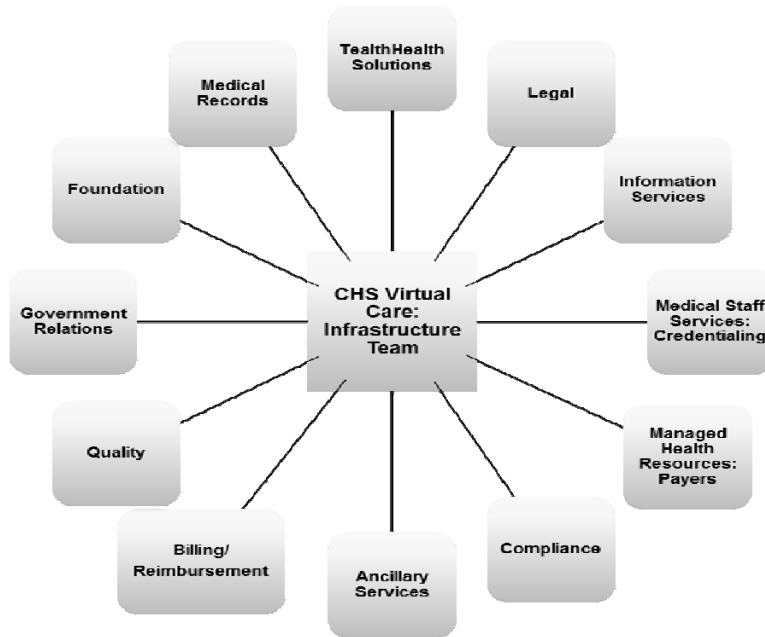
Over the past 18 months, a Virtual Care Steering Committee has been formed, chaired by our Chief Medical Officer and Executive Vice President, Dr. Roger Ray. I serve as the administrative lead responsible for development and implementation. We have successfully presented to the Strategic Planning Committee of our Board of Directors and received overwhelming endorsement. (Figure 12) Virtual care excellence was also recognized in October 2012 on the 2013 CHS Strategic Roadmap as a key priority under integrated systems of care, positioning it for increased support, attention and execution.

Figure 12: CHS Virtual Care Strategic Linkage



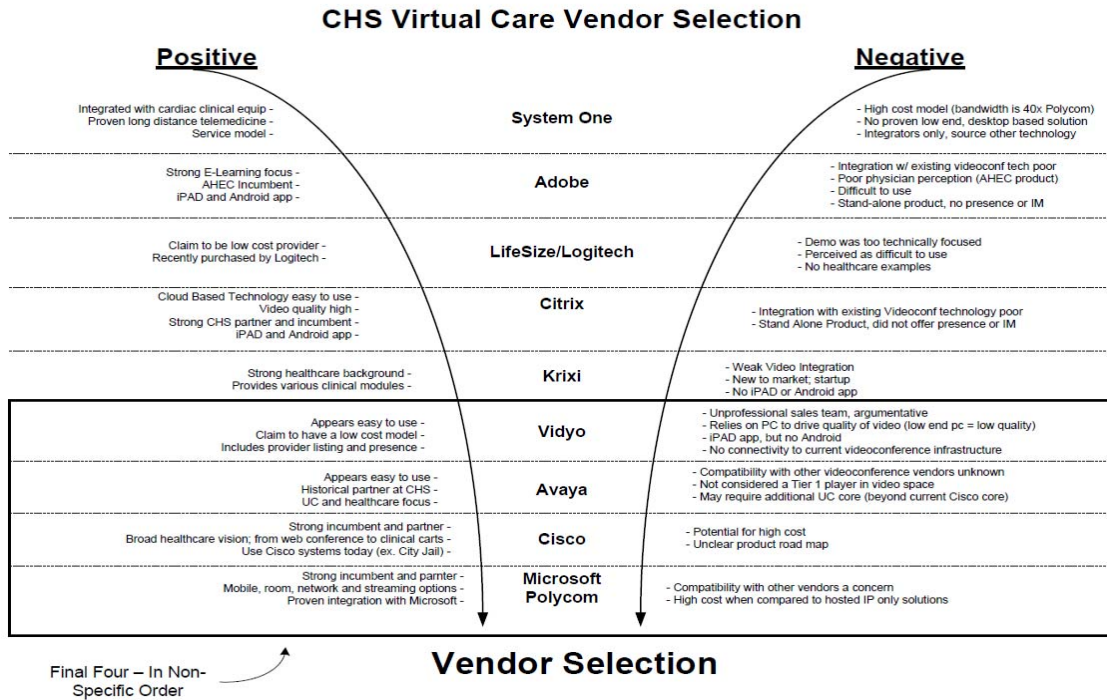
We also have compiled a multidisciplinary work team which spans CHS to ensure we are building a virtual care platform integrated into daily operations. Our goal at CHS is to create the same infrastructure to support a virtual care encounter as the physicians enjoy in the current face to face environment. Addressing the themes identified in the key informant interview, the components of each theme are covered by a content expert in the virtual care infrastructure team. (Figure 13)

Figure 13: CHS Virtual Care Infrastructure Team Components



Specific to the first theme, efficient technology, the team has also been hard at work on selection of virtual care products to serve CHS. Over twenty technology vendors have been previewed, with two finalists being selected in 2012 to serve virtual care functionality, including remote ICU monitoring which requires a more robust technological infrastructure. (Figure 14) While the products are selected, they have not been tested nor measured on a consistent basis to see if they will meet the standards expressed during the key informant interviews for reliability and ease of use. The information obtained during this research will be incorporated into the evaluation methodology of the technology vendors selected.

Figure 14: CHS Virtual Care Information Technology Vendor Selection



Finally, the infrastructure must be sustainable which includes an understanding of the cost associated with the provision of virtual physician care. A preliminary scope of expense relative to the technology is in process and a snapshot is provided below. It is anticipated this will go to the CHS corporate IT Steering Committee in February 2013 for overall approval to provide the budget necessary to pursue an enterprise wide technology platform to provide virtual physician care. (Table 16) To note, the cost estimates below includes technology only. The other human resource and operational costs will be determined by service line offering because manpower and clinical availability will differ by area.

Table 16: CHS Information Technology Steering Committee Funding Strategy

CONFIDENTIAL

Carolinas HealthCare System Virtual Care Funding Summary

Total Program Estimates	Capital - Total Program			Operating - Total Program			
	Virtual Care	Home Care	Total Capital	Virtual Care	Home Care	Total Operating	
Year 1	3,536,266	-	3,761,266	Year 1	375,000	150,000	525,000
Year 2	670,866	-	795,866	Year 2	575,000	600,000	1,175,000
Year 3	670,866	-	795,866	Year 3	575,000	600,000	1,175,000
Year 4	2,518,866	-	2,643,866	Year 4	575,000	600,000	1,175,000
Year 5	1,770,866	-	2,145,866	Year 5	575,000	600,000	1,175,000
	9,167,730	-	10,142,730		2,675,000	2,550,000	5,225,000

Program Expense Shares	Capital - eHealth Share			Operating - Regional Share			
	Virtual Care	Home Care	Total Capital	Virtual Care	Home Care	Total Operating	
Year 1	275,000	-	275,000	Year 1	166,050	-	166,050
Year 2	150,000	-	150,000	Year 2	166,050	-	166,050
Year 3	150,000	-	150,000	Year 3	166,050	-	166,050
Year 4	150,000	-	150,000	Year 4	166,050	-	166,050
Year 5	150,000	-	150,000	Year 5	166,050	-	166,050
	875,000	-	875,000		830,250	-	830,250

Net Exp	Capital - Net			Operating - Net			
	Virtual Care	Home Care	Total Capital	Virtual Care	Home Care	Total Operating	
	8,292,730	-	9,267,730		1,844,750	2,550,000	4,394,750

Source: Information Technology Steering Committee

2. Implement virtual physician care pilots at CHS to prove quality, reliability and efficiency of virtual care platform

CHS enjoys a couple areas of experience in virtual care, specifically telepsychiatry and teleorthopedics, with routine virtual visits provided on a weekly basis. After integrating the information gained through our key informant interviews, we knew it was important for us to implement a few focused pilots with key physician leaders to try out the use of virtual physician care within CHS and test our infrastructure and quality of the interaction. Purposeful, targeted work to address any issues, ensure patient safety, and gain physician confidence would create momentum to help other physicians in CHS see its value and understand the application of its integration into the care continuum.

In late 2010, CHS began conversations to provide telestroke and teleneurology coverage with the physicians from Charlotte to its hospitals in Charleston, South Carolina. Roper Saint Francis Hospital is a three hospital system with locations in downtown Charleston, West Ashley, and Mount Pleasant. This pilot was important for several reasons including the most far reaching geography within CHS, involvement of cross state licensure, and the development of a payment model for CHS by which to charge internally for virtual care since both North and South Carolina currently do not reimburse for virtual care.

The conversations have been robust but slow, involving several discussions surrounding quality of care, logistics, and involvement of community based physicians in the care continuum for the patients. Coverage for telestroke began at the Mount Pleasant site in mid 2011, but volume was very low as expected, and not all are necessitated a video connection and could be handled by physician conversations by phone. However, the halo effect of the technology availability included relationship development between clinicians in Charlotte and Charleston, staff training and daily calibration, check of the equipment, increasing familiarity and comfort with the technology. The administrative and physician leadership warmed to the possibility of delivering virtual care, showcasing the use of virtual care at a board meeting and interacting with the neurologists in Charlotte in a mock demo of a patient interaction.

All of this work set the stage for the robust discussions in progress during the fall of 2012 to expand telestroke services to all locations in Roper Saint Francis, and also to

include general teleneurology coverage for both Emergency Department and Inpatient units. The draft fee structure for this coverage and associated details are below and the anticipated start date is early 2013. (Table 17) It is important to note if virtual care was not an option for Roper Saint Francis Hospital (RSFH) through a CHS partnership their alternatives would be: 1. partner with another virtual care provider outside of CHS, or 2. not provide the service for their patients and for those needing neurology, refer the patient to a tertiary/ quaternary provider with the service (Medical University of South Carolina) 3. Recruit neurologists to join RSFH. Both option one and three would be more expensive than the model created below based upon market data and research by the administrators at RSFH.

Table 17: CHS TeleNeurology Fee Structure: Roper Saint Francis HealthCare

Proposal to Roper St. Francis

Start Up	
Per Cart (Expected Life: 4 Yrs)	\$11,847
Assume One Cart Per Facility	<u>3</u>
Total	\$35,541
Annual Access and Coverage	
Access (per cart)	\$2,400
Assume One Cart Per Facility	<u>3</u>
Total	\$7,200
Physician Coverage*	<u>\$328,440</u>
Total	\$335,640



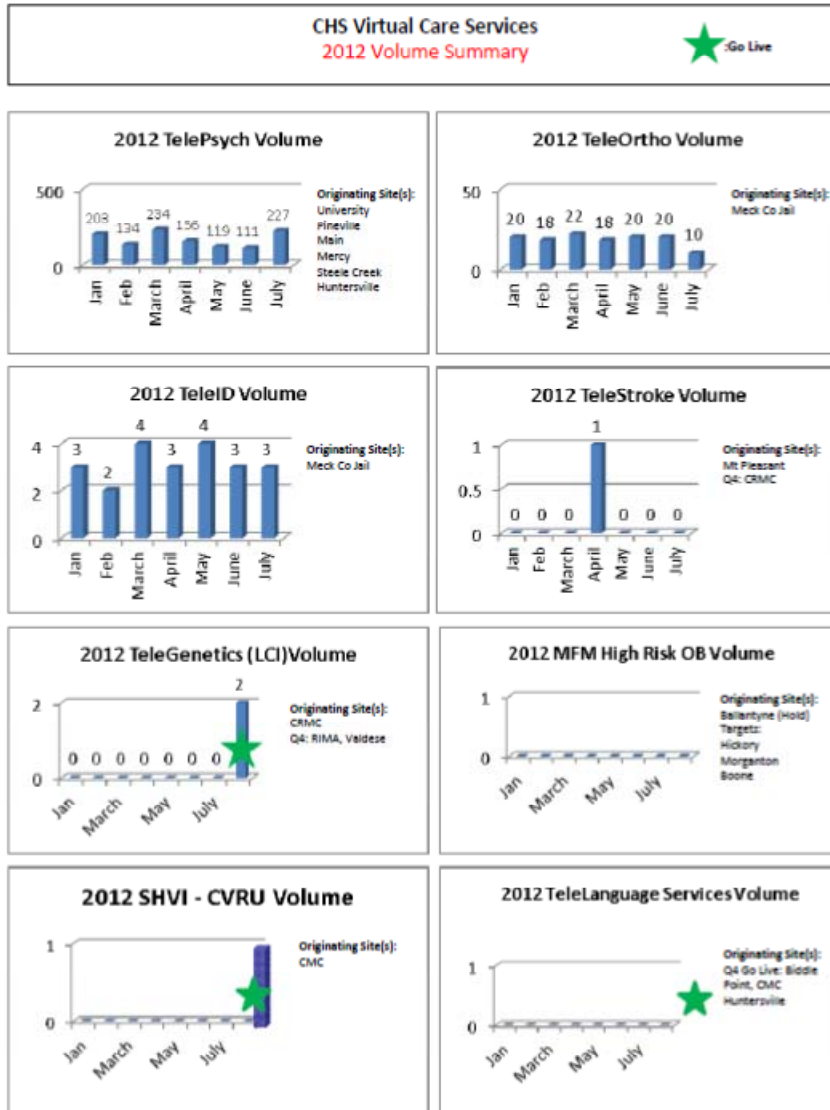
***Roper Proposal – Physician Coverage Details
Roper Hospital Only Example***

Roper	
Physician Coverage - Neuro	
Projected Neuro Consults (based on Neuro Discharges)	522
Consults Per Discharge	<u>1.5</u>
Projected # of Consults	783
Cost per Consult	<u>\$ 226.09</u>
Physician Coverage - Neuro Total	\$ 177,030
Physician Coverage - Stroke	
Projected Stroke Consults	78
Consults Per Discharge	<u>1.0</u>
Projected # of Consults	78
Cost per Consult	<u>\$ 253.34</u>
Physician Coverage - Stroke (Initial Consult)	\$ 19,761
Projected # of Follow-up Consults	39
Cost per Consult	<u>\$ 226.09</u>
Physician Coverage - Stroke (Follow-up)	\$ 8,818
Physician Coverage Stroke (Total)	\$ 28,578
Physician Oversight	\$10,000
Roper Total	\$ 215,608



In August 2012, CHS started virtual physician care in two key areas, telegenetics in collaboration of the Levine Cancer Institute and telecardiology, with the Sanger Heart and Vascular Institute. (Figure 15) Oncology and cardiology are two key service lines attracting much attention with senior leadership and physician leaders across CHS.

Figure 15: CHS Virtual Care Pilot Service Summary



Data as of September 2012

3. Contribute to the virtual care research literature on the quality and utilization of virtual physician care

It is important to note other key areas of research needed in the area of virtual care to add to the literature fueling its acceptance by physicians. Randomized control trials proving virtual care is comparable or of better quality as compared to the traditional care

models are important in order for clinicians to increase their comfort level with the safety of this care model for their patients. These studies should be longitudinal—spanning timeframes of a year or longer would prove particularly helpful—since the sustainment of health or disease management is an important factor for understanding virtual care’s efficacy as a standard model of care.

In 2012, the literature reviews conducted for this dissertation has been used in several grant applications at CHS to support the use of virtual care, resulting in a successful achievement of a Beacon Grant supporting the use of virtual care for diabetic patients. This is also being conducted as a randomized control trial with the intent to publish the literature on its efficacy, quality, and impact on hospitalizations and office visits. We are awaiting the decision on other grants including work in heart failure and behavioral health.

Furthermore, the Department of Family Medicine at Carolinas Medical Center, under the leadership of Dr. Michael Dulin, is in process of submitting two applications to the CHS Internal Review Board (IRB) to study the efficacy of virtual care for their patients in both the ambulatory environment and during the discharge process from the acute care setting. The work from this research project along with the experience I have gained through the DrPH program has allowed for my team and me to be thoughtful participants in this process. The application of research in partnership with the development and operational improvement for provision of care is something we are striving to do more of at CHS, and virtual care and its application is ripe for further

research. As stated in a recent email by the Corporate Vice President for Research for CHS, Bernard Brigonnet. (Figure 16)

Figure 16: Email: CHS Corporate Vice President of Research Support for Virtual Care

From: Brigonnet, Bernard

Sent: Wednesday, September 26, 2012 9:06 AM

To: Connell, Joan; Owens, Clayton; McDermid, Melanie

Cc: Anderson, Caren; Kaney, Kathleen; Dulin, Michael; Hurtado vaca, Cecilia A

Subject: Virtual care experiment

I just had a conference call on Dr Dulin's upcoming research program on using virtual care. Initially, it will be a pilot program on depression involving three physicians. If successful (even if not clinically, we will have plenty of lessons to learn from it), the plan is to expand to wider-impact indications such as diabetes. CHS has a great opportunity to stand out in a field which represents one of the key features of tomorrow's practice of medicine. The goal is to put best practices standards in the hands of PCPs by way of electronic interaction.

We need to provide full support to the project, both from a logistic and innovation-management perspectives. M Dulin needs a research coordinator who I think could double up as project manager on the subject as a whole. Melanie, please contact Katie Kaney for further documentation and let's get together to finalize the set-up from our end and provide M Dulin with the support he needs ASAP.

This is exciting and we should anticipate IP opportunities as well!

Thanks,

Bernard

Bernard C. Brigonnet

Corporate VP, Research

Carolinas HealthCare System

Research validating the efficiency implications of virtual care on physician resources should also prove helpful. While the premise is that the integration of a virtual care platform should improve efficiency to physician productivity, there is limited research documenting exactly how or where this is realized. A more concise understanding of the value proposition and financial picture of implementing virtual physician care is needed. Conversations within CHS are in process about how best to

approach this research, including discussions with the academic training programs and increased efficiency and utilization of teaching with the overlay of virtual physician care.

4. Position the CHS virtual care program to become a model for the rest of the country

Carolinas HealthCare System can be a model for the country to follow on the use of virtual physician care as integrated into current care process to enhance outcomes and efficiency. We should be able to use our experience to help and challenge others across the country to consider the value of virtual care both for clinicians and patients. The addition of virtual physician care as a mainstream care platform should have many benefits to the community, including functioning as a tool to combat physician shortage and distribution issues, ultimately increasing access and efficiency, to improve the health of America.

In the fall of 2012, I will be speaking at a conference focused on the establishment of a neuroscience service line targeting healthcare administrators and physician leaders. The presentation will include a case study of Carolinas Stroke Network and the integration of virtual physician care with a plan to serve all 34 hospitals within Carolinas HealthCare System. This is just one service line in which we can tout the improvement of services with the integration of virtual physician care into already existing traditional models of care.

Members of the CHS medical staff and leadership present nationally hundreds of times annually. Our goal is to increase the number of presentations at national

conferences in 2013 and beyond which incorporate the use of virtual physician care to expand and enhance the current care provided by our clinicians. Areas ripe for 2013 include Levine Cancer Institute and the use of virtual genetic counseling, maternal fetal medicine providers using virtual care to cover several office locations, and a critical care/intensivist network to cover the CHS enterprise, similar to the stroke coverage example. While this should increase the national profile of CHS and help our clinicians increase their reputation in their specific arena, the real benefit is to demonstrate and share best practices on the integration and utilization of virtual care to help improve service to patients and populations.

5. Explore policy development to advocate for the provision of virtual care in public health and healthcare

North and South Carolina are not included in the list of states that enjoy legislation supporting and recognizing virtual care from a quality and reimbursement perspective. North Carolina law requires that, in general, physicians practice only in the state in which they are licensed (N.C.G.S. § 90-18). Currently, there are no specific state statutes regarding virtual care, with the exception of mental health evaluations under N.C.G.S. § 122C-263. Until there is clearer guidance, all physicians will have to be licensed in the state in which the patient is located.

The North Carolina Medical Board has drafted a Board Position on virtual care that imposes several requirements on the physician, including an appropriate examination of the patient, informed consent, and medical record documentation, among others. The proposed position went up for approval in January 2010, but was sent back to committee

for review and has not yet been finalized. In the interim, the Medical Board has a published Position Statement that requires that there be contact with a patient before prescribing medications.

In collaboration with our government relations team at CHS, work is currently underway with both the North Carolina Medical Board and the North Carolina Hospital Association to invite legislation bringing the use of virtual physician care into the forefront. Work is also underway with the managed health resources arm of CHS, focused on commercial and private payers to understand how best to incorporate virtual physician care into our payer contracts.

CHS also looks to influence this legislation and policy at a federal level, once it gains more experience and understanding about the impact of virtual physician care. While there is more movement in process, this area is still in need of development in order to create an environment where care can be provided virtually without compromise to quality or safety for patients, communities, and providers.

As the second largest public healthcare system in the United States, Carolinas HealthCare System is positioned to lead by example to test the virtual physician care platform and integrate it appropriately into the care continuum to improve service and access to patients and communities. By following the plan for change, CHS will help transform the current healthcare industry to embrace new models of care and accelerate the use of virtual physician care to become a common, safe, effective practice of medicine. In turn, success measures such as improved access to physicians and increased

patient compliance impact population health statistics and the overall health of communities served.

Appendix A:

Search Terms and Criteria: What is the Quality of Virtual Physician Care?

RCT for Non-Mental Disorders

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1948 to Present>

Search Strategy:

-
- 1 *telemedicine/ or *remote consultation/ (8710)
 - 2 exp *"diseases (non mesh)"/ (8830178)
 - 3 exp "Quality of Health Care"/ (3959259)
 - 4 evidence-based practice/ or exp evidence-based medicine/ (42579)
 - 5 exp Mental Disorders/ (800104)
 - 6 exp *Mental Disorders/ (653372)
 - 7 Primary Health Care/ (43590)
 - 8 *Primary Health Care/ (27269)
 - 9 2 or 6 or 8 (9114888)
 - 10 9 and 1 (2582)
 - 11 patient compliance/ or medication adherence/ (41893)
 - 12 10 and (3 or 4 or 11) (1651)
 - 13 limit 12 to (english language and humans) (1528)
 - 14 limit 13 to (case reports or comment or editorial or letter or news or newspaper article) (108)
 - 15 13 not 14 (1420)
 - 16 limit 15 to meta analysis (7)
 - 17 16 and (cochrane.jw. or systematic review\$[1.af.](#)) (20)
 - 18 16 or 17 (21)
 - 19 15 not 18 (1399)
 - 20 19 and (telephon\$ or telemonitor\$.af. (353)
 - 21 19 not 20 (1046)
 - 22 limit 21 to "review articles" (45)
 - 23 21 not 22 (1001)
 - 24 limit 23 to (consensus development conference or consensus development conference, nih or guideline or practice guideline) (1)
 - 25 23 not 24 (1000)
 - 26 limit 25 to randomized controlled trial (155)
 - 27 25 not 26 (845)
 - 28 limit 27 to (clinical trial, all or comparative study or controlled clinical trial or evaluation studies or multicenter study or "research support, american recovery and reinvestment act" or research support, nih, extramural or research support, nih, intramural or research support, non us gov't or research support, us gov't, non phs or research support, us gov't, phs or "scientific integrity review" or technical report or twin study or validation studies) (568)
 - 29 26 not 6 (118)**

Appendix B:

Search Terms and Criteria: What are the Barriers to the Adoption of Virtual Physician Care?

Physician Acceptance, Physician-Related Barriers to Virtual Care Medline (August 2011)

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1948 to Present>

Search Strategy:

-
- 1 *Telemedicine/ (7043)
 - 2 *Remote Consultation/ (2257)
 - 3 telehealth.af. (1179)
 - 4 (ehealth or e-health).af. (2389)
 - 5 virtual care.af. (4)
 - 6 exp Physicians/ and (1 or 2 or 3 or 4 or 5) (174)
 - 7 limit 6 to (case reports or comment or editorial or letter or news or newspaper article) (11)
 - 8 6 not 7 (163)
 - 9 limit 8 to meta analysis (0)
 - 10 8 and (cochrane.jw. or systematic review\$1.af.) (0)
 - 11 limit 8 to "review articles" (7)
 - 12 8 not 11 (156)
 - 13 limit 12 to (consensus development conference or consensus development conference, nih or guideline or practice guideline) (1)
 - 14 12 not 13 (155)
 - 15 ((accept\$ or barrier\$ or adopt\$) and (physician\$ or doctor\$1)).af. and (1 or 2 or 3 or 4 or 5) (347)
 - 16 limit 15 to english language (332)
 - 17 16 not 6 (286)
 - 18 limit 17 to (case reports or comment or editorial or letter or news or newspaper article) (3)
 - 19 17 not 18 (283)
 - 20 limit 19 to meta analysis (0)
 - 21 19 and (cochrane.jw. or systematic review\$1.af.) (5)
 - 22 19 not 21 (278)
 - 23 limit 22 to "review articles" (26)
 - 24 22 not 23 (252)
 - 25 limit 24 to (consensus development conference or consensus development conference, nih or guideline or practice guideline) (1)
 - 26 24 not 25 (251)

Appendix C:
Email Invitation to Potential Key Informant Interview Participants

From: Katie Kaney
To: Potential Key Informant Interviewee
C: Dr. Roger Ray, Executive Vice President, Carolinas Healthcare System
Subject: Request for Participation in Research Study on Acceleration of Virtual Physician Care: Key Informant Interview

Dear Insert Physician Name:

I am contacting you with the hope you will join me in a research study focusing on the accelerating the use of virtual physician care. I am currently pursuing my doctorate in Public Health and Health Leadership at the UNC Gillings School of Global Public Health and will use the results of this research as my dissertation but also to improve the current development of a virtual physician care system at CHS.

Physician leaders at CHS are the targeted key informant participants and my plan is to complete 15 interviews.

If you are willing, I will set up a meeting at the time and place of your choice, taking no longer than 30 minutes. I would appreciate the ability to audiotape the interviews, and will also bring a written consent form formalizing our interaction and participation in the research.

Please understand your participation is completely voluntary and has no consequence, positive or negative, to your role within CHS. There are no “right” answers and participants will be expected to answer with full disclosure and honesty.

Dr. Roger Ray, Executive Vice President at CHS, copied on this email, reinforces this statement and offers his support and encouragement to participate without any fear of consequence, positive or negative, regardless of your answers.

Thanks in advance for your expertise, time and commitment to helping advance our knowledge in this area to help accelerate the use of virtual physician care.

Katie Kaney

Appendix D: Interview Guide

Key Informant Interview Guide: Acceleration of Virtual Physician Care

Welcome:

Thank you for agreeing to participate in this interview to discuss the acceleration of the use of virtual physician care. I am Katie Kaney, a student in the UNC Doctor of Public Health Program. I am also a System Vice President at Carolinas Healthcare System (CHS) responsible for Outreach Development and Coordination. The information I collect as a part of this study is for my dissertation research but could also help to improve the current development of a virtual physician care system at CHS. In no way does your participation or your answers have any consequence to your role at CHS. Dr. Roger Ray, Executive Vice President at CHS, reinforces this statement and offers his support and encouragement to participate without any fear of consequence, regardless of your answers.

I may publish portions of the dissertation, in which case the findings would become publicly available. The interview will be completely confidential and any information you provide will be released only as group summaries. Your name is not connected to your answers. Tapes and transcriptions will be destroyed at the end of the research study. In order to fully capture your responses today, I would like to record our conversation. Do I have your permission to do so?

[If yes]: If you would like to have me stop the recording at any point in our conversation, please let me know and I will stop the recording.

Introduction:

Thank you so much for agreeing to talk to me and participate in this research study. The purpose of this interview is to learn more about how the platform of virtual physician care can be implemented so it will be accelerated as a model for the care of patients across Carolinas HealthCare System. Fifteen physician leaders from across the organization will participate in the interviews. The interview should take no more than thirty (30) minutes.

For the purposes of this study, virtual physician care is the use of a technology to care for a patient, rather than an in-person interaction.

I am happy to answer any questions you have about the research study or the interview.

Key Informant Interview Questions:

Opening:

- *What is your job title?*
- *How long have you been with Carolinas HealthCare System?*

Introduction:

- *Please describe any experience you have had with virtual physician care?*

Draft Questions:

1. *What would accelerate the use of virtual physician care?*
2. *Where do you see virtual physician care adding the most value?*
Probe: Do you think it would improve access or efficiency?
3. *Do you have any concerns about virtual care?*
Probe: Do you have concerns about quality of care, peer support or system support
4. *How could virtual physician care become a mainstream, viable care model for CHS?*
5. *What do you need as a leader to advocate for the use of virtual physician care?*

End Question:

- *Is there anything else you would like to add or you feel is important for me to capture?*

Conclusion:

Thank you for your time today to discuss the acceleration of virtual physician care. The information and insights you shared will be valuable to my study. If you are interested, I would be happy to share the results of my research when the final report has been approved and accepted by UNC.

Appendix E:
Written Consent Form

Written Consent Form: Adult Participants in a Research Study
University of North Carolina-Chapel Hill

IRB Study #12-0839

Consent Form Version Date: April 2012

Title of Study: Accelerating the use of Virtual Physician Care

Principal Investigator: Katie Kaney; kaney@unc.live.edu; (704) 287- 6342

UNC-Chapel Hill Department: School of Public Health, Department of Health Policy and Management

Faculty Advisor: Sandra Greene, DrPH; sandrab_greene@unc.edu; (919) 966-0993

Study Contact email: Kaney@live.unc.edu

What are some general things you should know about research studies?

You are being asked to take part in a research study. To join the study is voluntary. You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty. Research studies are designed to obtain new knowledge. This new information may help people in the future. You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies. Details about this study are discussed below. It is important that you understand this information so that you can make an informed choice about being in this research study. You will be given a copy of this consent form. You should ask the researchers named above, or staff members who may assist them, any questions you have about this study at any time.

What is the purpose of this study?

The purpose of this research study is to learn about how the use of virtual physician care can be accelerated. You are being asked to participate in the study because you have a physician leadership role related to the implementation and delivery of clinical care services within Carolinas HealthCare System.

The principal investigator is a student in the UNC Doctor of Public Health Program and also a System Vice President at Carolinas HealthCare System (CHS) responsible for Outreach Development and Coordination. The information collected as a part of this study is for dissertation research but could also help to improve the current development of a virtual physician care system at CHS.

In no way does your participation or your answers have any consequence to your role at CHS. Dr. Roger Ray, Executive Vice President at CHS, reinforces this statement and offers his support and encouragement to participate without any fear of consequence, regardless of your answers.

How many people will be interviewed for this study?

If you decide to be interviewed for this study, you will be one of 15 physicians interviewed for this research study.

How long will your part in this study last?

If you decide to be interviewed for this study, you will be asked to meet in person for a 30 minute interview.

What will happen if you take part in the study?

Participation in an interview for this study will involve the following steps:

- Review the consent form to determine your interest in participating in this study
- Contact the researcher listed on the first page of this form with any questions or concerns regarding your participation.
- Execute the consent form to participate
- Participate in a 30 minute in-person interview

What are the possible benefits from being in this study?

You may benefit from participation in this study by discovering ways the use of virtual physician care could enhance the current clinical programs and delivery systems in place at Carolinas HealthCare System. This research is designed to benefit society by gaining new knowledge. You may not benefit personally from being in this research study.

What are the possible risks or discomforts involved from being in this study?

There are no known or expected risks to participating in this study. As stated above, there will be no consequence, positive or negative, on your role or employment at CHS. Interviewees are free to take breaks and/or terminate the interview at any time.

How will your privacy be protected?

The information provided through the interviews is confidential (i.e., not shared with anyone outside of the research team) and voluntary (i.e., not obligated to answer any question).

Privacy risks and confidentiality will be addressed as follows:

1. All interviews with physician leader participants will be conducted in private locations of the interviewees choosing.
2. Identification numbers, rather than names, will be used on research materials to identify participants.
3. Hard copies of data and collateral materials such as consent forms will be stored separately in a locked cabinet in the office of the principle investigator. All interview data will be stored in password protected files on a computer at in the principal investigator's office.

Once the data is analyzed and the study completed, all recordings will be destroyed to ensure that no responses would be linked to an individual. The results will be presented in the aggregate and the names of the individuals kept confidential. Descriptors of key

informants are included, but in order to maintain confidentiality of the respondent, these participants' names are not included.

UNC-Chapel Hill will take steps allowable by law to protect the privacy of personal information. In some cases, your information in this research study could be reviewed by representatives of the University, research sponsors, or government agencies for purposes such as quality control or safety.

Will you receive anything for being in this study?

You will not receive anything for taking part in this study.

Will it cost you anything to be in this study?

Other than your time, there will be no costs for participating in the study.

What if you have questions about this study?

You have the right to ask, and have answered, any questions you may have about this research. If you have questions, or concerns, you should contact the researcher listed on the first page of this form.

What if you have questions about your rights as a research participant?

All research with human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a research participant you may contact, anonymously if you wish, the Institutional Review Board at 919/966-3113 or by email to IRB_subjects@unc.edu.

Signature of Participant: _____

Date: _____

Appendix F: Virtual Physician Care: Quality Literature Review Results

	Title	Source	Year	Health Specialty	Volume (Patients)	Outcome
1	Feasibility of using a computer-assisted intervention to enhance the way women with breast cancer communicate with their physicians	Cancer Nursing - 25(6): 417-24, 2002 Dec	2002	Cancer	749 patients	comparable
2	The TeleGuard trial of additional telemedicine care in CAD patients. 2 morbidity and mortality after 12 months	Journal of Telemedicine & Telecare - 14(1): 22-6, 2008	2008	Cardiovascular	1500 patients	comparable
3	A comparison of real-time and store-and-forward teler dermatology. a cost-benefit study	British Journal of Dermatology - 143(6): 1241-7, 2000 Dec	2000	Dermatology	96 patients	comparable
4	Telehealth behavior therapy for the management of type 1 diabetes in adolescents	Journal of Diabetes Science & Technology 4(1):199-208, 2010	2010	Chronic Disease	22 patients	comparable
5	Use of an internet-based telemedicine system to manage underserved women with gestational diabetes mellitus	Diabetes Technology & Therapeutics- 9(3): 297-306, 2007 Jun	2007	Chronic Disease	32 patients	comparable
6	The effect of telepharmacy counseling on metered-dose inhaler technique among adolescents with asthma in rural Arkansas	Telemedicine Journal & E-Health- 7(3): 207-17, 2001	2001	Chronic Disease	107 patients	comparable
7	Randomized controlled trial of telemedicine for new neurological outpatient referrals	Journal of Neurology, Neurosurgery & Psychiatry - 71(1): 63-6, 2001 Jul	2001	Neuroscience	168 patients	comparable
8	Increasing access to specialty care: a pilot, randomized controlled trial of telemedicine for Parkinson's disease	Movement Disorders - 25(11): 1652-9, 2010 Aug 15	2010	Neuroscience	14 patients	comparable
9	Long-term effects of specialized stroke care with telemedicine support in community hospitals on behalf of the Telemedical Project for Integrative Stroke Care (TEMPIS)	Stroke - 40(3):902-8, 2009 March	2009	Neuroscience	1,938 patients	comparable
10	Limited benefits of ambulance telemetry in delivering early thrombolysis: a randomized controlled trial	Emergency Medicine Journal - 22(3): 209-15, 2005 March	2005	Cardiovascular	999 patients	comparable
11	Internet-based Outpatient telerhabilitation for patients following total knee arthroplasty: a randomized controlled trial	Journal of Bone & Joint Surgery - American Volume (93-(2):113-20, 2011 Jan	2011	Orthopedic	65 participants	comparable
12	Differences in diagnosis and treatment using telemedicine versus in-person evaluation of acute illness	Ambulatory Pediatrics 6(4):187-95; discussion 196-7, 2006 Jul-Aug	2006	Minor illness	492 visits	comparable
13	Role of telecardiology in the assessment of angina in patients with recent acute coronary syndrome	Journal of Telemedicine & Telecare - 11(Suppl 1): 93-4, 2005	2005	Cardiovascular	200 patients	comparable

14	TELEMAM: a cluster randomized trial to assess the use of telemedicine in multi-disciplinary breast cancer decision making	European Journal of Cancer - 43(17): 2506-14, 2007 Nov	2007	Cancer	473 patients	comparable
15	Alternatives for cardiac rehabilitation patients unable to return to a hospital-based program	Heart & Lung- 22(4): 298-303, 1993 Jul-Aug	1993	Cardiovascular	20 patients	comparable
16	Tele-assistance in chronic respiratory failure patients: a randomized clinical trial	European Respiratory Journal - 33(2): 411-8, 2009 Feb	2009	Chronic Disease	240 patients	comparable
17	A feasibility study of home telemedicine for patients with cystic fibrosis awaiting transplantation	Journal of Telemedicine - 14(4): 182-5, 2008	2008	Transplant	71 patients	comparable
18	Store-and-forward teledermatology results in similar clinical outcomes to conventional clinical-based care	Journal of Telemedicine & Telecare 12(1): 26-30, 2007	2007	dermatology	776 patients	comparable
19	Evaluation of digital skin images submitted by patients who received practical training or an online tutorial	Journal of Telemedicine & Telecare 12(2): 79-82, 2006	2001	dermatology	50 patients	comparable
20	Accuracy and reliability of store-and forward teledermatology: preliminary results from the St George Teledermatology Project	Australasian Journal of Dermatology - 42(4): 247-51, 2001 Nov	2001	dermatology	49 patients	comparable
21	Multicentre randomized control trial comparing real time teledermatology with conventional outpatient dermatological care: society cost-benefit analysis	BMJ - 320(7244) : 1252-6, 2000 May 6	2000	dermatology	102 patients	comparable
22	A randomized trial to evaluate the efficacy of online follow-up visits in the management of acne	Archives of Dermatology - 146(4): 406-11, 2010 April	2010	dermatology	151 patients	comparable
23	Reinforced follow up for children and adolescents with type 1 diabetes and inadequate glycaemic control: a randomized controlled trial intervention via the local pharmacist and telecare	Diabetes & Metabolism 32(2):159-65, 2006 April	2006	Chronic Disease	100 patients	comparable
24	Columbia University's informatics for Diabetes Education and Telemedicine (IDEATel) Project: rationale and design	Journal of the American Medical informatics Association 0- 9 (1): 49-62, 2002 Jan-Feb	2002	Chronic Disease	1500 patients	comparable
25	Telemedicine improved diabetic management	Military Medicine - 165(8): 579-84, 2000 Aug	2000	Chronic Disease	28 patients	comparable
26	Telemedicine: teleproctored endoscopic sinus surgery	Laryngoscope - 112(2): 216-9, 2002 Feb	2002	Surgery	42 patients	comparable
27	Internet-enhanced Management of fibromyalgia: a randomized controlled trial	Pain - 151 (3): 694-702, 2010 Dec	2010	Chronic Disease	118 patients	comparable

		Trials [Electronic Resource] - 10:42, 2009					
28	Design of the evolution of management strategies of heart failure patients with implantable defibrillators (EVOLVO) study to assess the ability of remote monitoring to treat and triage patients more effectively			2009	Cardiovascular	200 patients	comparable
29	Rapid titration of carvedilol in patients with congestive heart failure: a randomized trial of automated telemedicine vs. frequent outpatient clinic visits	American Heart Journal - 151(6): 844 e1-10, 2006 Apr		2006	Cardiovascular	49 patients	comparable
30	The safety and effectiveness of minor injuries telemedicine	Emergency Medicine Journal - 21(4):438-45, 2004 July		2004	Minor illness	600 patients	comparable
31	Accuracy of orthognathic evaluation using telemedicine technology	Telemedicine Journal - 4(2): 153-60, 1998		1998	Dental	13 patients	comparable
32	Videoconferencing for orthopedic outpatients: one-year follow up	Journal of Telemedicine & Telecare - 9(1):8-11, 2003		2003	Orthopedic	145 patients	comparable
33	The feasibility of telemedicine for orthopedic outpatient clinics- a randomized controlled trial	Journal of Telemedicine & Telecare - 6(4): 193-8, 2000		2000	Orthopedic	145 patients	comparable
34	The role of telemedicine in CPAP compliance for patients with obstructive sleep apnea syndrome	Sleep & Breathing 10(3):132-8, 2006 Sept		2006	Chronic Disease	15 patients	comparable
35	Infection, rejection, and hospitalizations in transplant recipients using telehealth	Progress in Transplantation - 18(2): 97-102, 2008 June		2008	Transplant	106 patients	comparable
36	E-health empowers patients with ulcerative colitis: a randomized controlled trial of the web-guided "Constant-care" approach	Gut. 59(12): 1652-61, 2010 Dec		2010	Chronic Disease	333 patients	comparable
37	Health coaching via an internet portal for primary care patients with chronic conditions: a randomized controlled trial	Medical Care - 47(1): 41-7, 2009 Jan		2009	Chronic Disease	241 patients	not enough research to conclude
38	Telemedicine in dermatology: a randomized controlled trial	Health Technology Assessment (Winchester, England) 10(43):iii-iv, ix-xi, 1-39, 2006 Nov		2006	Dermatology	92 patients	not enough research to conclude
39	Tele-guidance of chronic heart failure patients enhances knowledge about the disease. A multi-centre, randomized controlled study	European Journal of Heart Failure - 10(11): 1136-42, 2008 Nov		2008	Cardiovascular	214 patients	not enough research to conclude
40	Evaluation of a Web-based intervention providing tailored advice for self-management of minor respiratory symptoms: exploratory randomized controlled trial	Journal of Medical Internet Research - 12(4) e66, 2010		2010	Minor illness	214 patients	not enough research to conclude
41	Functional and clinical outcomes of telemedicine in patients with spinal cord injury	Archives of Physical Medicine & Rehabilitation - 89(12): 2332-41, 2008 Dec		2008	Neuroscience	unknown	not enough research to conclude

42	A randomized trial comparing telemedicine case management with usually care in older, ethnically diverse, medically underserved patients with diabetes mellitus: 5 year results of the IDEATel study	Journal of the American Medical Informatics Association - : 16(4): 446-56, 2009 July - Aug.	2009	Chronic Disease	1,665 patients	telemedicine is better
43	Internet based monitoring of asthma: a long-term, randomized clinical study of 300 asthmatic subjects	Journal of Allergy & Clinical Immunology - 115(6): 1137-42, 2005 June	2005	Chronic Disease	100 patients	telemedicine is better
44	The TeleGuard trial of additional telemedicine care in CAD patients. 1 Utilization of the system	Journal of Telemedicine & Telecare - 14(1): 17-21, 2008	2008	Cardiovascular	171 patients	telemedicine is better
45	Teledermatologic consultation and reduction in referrals to dermatologists: a cluster randomized controlled trial	Archives of Dermatology - 145(5): 558-64, 2009 May	2009	Dermatology	631 patients	telemedicine is better
46	Nonmydriatic teleretinal imaging improves adherence to annual eye examinations in patients with diabetes	Journal of Rehabilitation Research & Development 43(6):733-40, 2006 Sept-Oct	2006	Chronic Disease	448 patients	telemedicine is better
47	Impact of telehealth on clinical outcomes in patients with heart failure	Clinical Nursing Research - 17(3):182-99, 2008 Aug	2008	Cardiovascular	284 patients	telemedicine is better
48	Subtle orthopedic fractures: teleradiology workstation vs. film interpretation	Radiology - 187(3) : 811-5, 1993 June	1993	Orthopedic	120 patients	telemedicine is not as effective

Appendix G: Virtual Physician Care: Barriers Literature Review Results

Barriers												
Title	Source	Country	Year	Training	Patient Acceptance	MD Attitude	Legal/Regulatory	Quality	Reimbursement	Liability	Technology	System (time/convenience)
1 Telemedicine, the internet, and world wide web: overview, current status, and relevance to surgeons	World of Journal of Surgery- 25(11):1449-57, 2001 Nov	US	2001				1	1	1	1	1	
2 Evaluation methods in telehealth: getting to outcomes a physician's insight	Telemedicine Journal & E-Health-16(10):984-5, 2010 Dec	US	2010						1			
3 Teleconsultation service to improve healthcare in rural areas: acceptance, organizational impact and appropriateness	BMC Health Services Research-9:238, 2009	ITALY	2009					1				1
4 Changes in provider attitudes toward telemedicine	Telemedicine Journal & E-Health- 15(1):39-43, 2009 Jan	US	2009					1				
5 Acceptability to primary care providers of telemedicine in diabetes case management	Journal of Telemedicine & Telecare-14(6):306-8, 2008	US	2008					1				
6 A survey of recipient client physician satisfaction with teleoncology services originating from thunder bay regional sciences centre	Telemedicine Journal & E-Health - 14(3):250-4, 2008 April	CANADA	2008		1						1	1
7 What do Spanish physicians believe and expect about telemedicine? Results of a Delphi-based survey	Telemedicine Journal & E-Health-14(1):42-8, 2008 Jan-Feb	SPAIN	2008	1								
8 The slow pace of interactive video telemedicine adoption: the perspective of telemedicine program administrators on physician participation	Telemedicine Journal & E-Health-13 (6): 645-56 , 2007 Dec	US	2007		1				1			
9 Specialist physicians' knowledge and beliefs about telemedicine: a comparison of users and nonusers of the technology	Telemedicine Journal & E-Health-13(5):487-99, 2007 Oct	US	2007			1			1			1
10 Exploring the effects of telehealth on medical human resources supply: a qualitative case study in remote regions	BMC Health Services Research - 7:6-, 2007	CANADA	2007								1	

40	Teleconsulting: a practical account of pitfalls, problems and promise. Experience from the TEAM project group	Journal of Telemedicine & Telecare - 2 Suppl 1:1-3, 1996	UK	1996														
			Total	6	13	26	3	15	10	6	14	20						
			%	5%	12%	23%	3%	13%	9%	5%	12%	18%						

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