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Provider and Patient Satisfaction with the Use of Telemedicine in the Delivery of Healthcare

Rohit Dhingra

Union College - Schenectady, NY

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PROVIDER AND PATIENT SATISFACTION WITH THE USE OF TELEMEDICINE
IN THE DELIVERY OF HEALTHCARE

By:

Rohit Dhingra

Advisor: Professor Goldner

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Department of Sociology

UNION COLLEGE

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Abstract

The objective of this thesis was to look at provider and patient satisfaction with the use of telemedicine in the delivery of healthcare. From the literature, it is clear that the providers and patients find different aspects of telemedicine to be appealing but have noted certain limitations with its use. Each study that was reviewed in the literature explored a different type of telemedicine, but in no way covered all of its current applications. In my study, I interviewed three patients and three providers. The patients all use a homecare telemedicine unit in which they can self-measure basic vital signs, which are electronically transferred and monitored by providers elsewhere, of whom one was interviewed. The second provider is a general practitioner who uses telemedicine extensively in his practice while the third provider uses it to electronically educate other practitioners. I found that the patients and providers are satisfied with the use of telemedicine in healthcare but do feel that telemedicine has its limitations, which agreed with the literature. Positive aspects of telemedicine were that it is convenient, saved costs and improved care. However, the subjects noted certain limitations including technological incompatibility and loss of personal interaction. Telemedicine is a new and growing field of medicine that will require more research in order for its application to be used widespread.

Preface and Introduction

As we enter the 21st century and enter an era known as the *Information Age*, we are realizing that technology and its capabilities are almost limitless. Telemedicine, or the concept of applying innovative technology to medicine, has only recently entered the spotlight (Darkins and Cary 2000). The field of medicine is constantly becoming more advanced as we find more ways to provide healthcare in a more effective and efficient way. Telemedicine was originally introduced in the 1950s (Darkins and Cary 2000); however, with the lack of both the proper technology and evidence of effectiveness, it took a very long time for telemedicine to finally be accepted by society (Darkins and Cary 2000).

Telemedicine has received a lot of criticism as some complain that it provides impersonal care and takes away from the patient and physician relationship that is so highly valued today. Although telemedicine sometimes creates a barrier between patients and their provider, it allows those patients to receive care that they would otherwise not have access to. This is the case for patients who live in rural areas, have chronic diseases and require constant monitoring or those whose condition has simply left them homebound. Therefore, telemedicine has significant sociological implications as it challenges the way medicine has been traditionally practiced for hundreds of years. Its effects can be described from both a patient and provider perspective (Darkins and Cary 2000).

In this thesis, I studied patient and provider satisfaction with the use of telemedicine in the delivery of care for patients. Telemedicine can come in several different forms ranging from sending electronic medical records to examining a patient's body with an electronic scope. The patients and providers I interviewed have each had a

unique experience in the field of telemedicine, which is why my findings are significant even though their responses are concurrent with that in the literature. Despite this, more needs to be known about the medical and economic effects of telemedicine on patients and their providers.

The first chapter explores the literature that relates to the use of telemedicine today. Chapter 2 outlines the methods of my study including my research instrument, sampling population and forms of analysis. The third chapter discusses my results and how these results relate back to the literature review from chapter 1. Finally, chapter 4 outlines general conclusions I was able to make, significance and implications of my research, limitations and suggestions for any future research.

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Chapter 1: Literature Review

1.) Introduction

Patients are always the first to be affected in any new kind of medical intervention. Common measures to observe these effects include patient satisfaction and medical outcomes. For the most part, telemedicine has shown to be positively received by patients and actually improves their health. These results were widely noted in patients who live in rural areas and/or have chronic conditions such as diabetes and require frequent follow-ups.

The use of telemedicine also has a large impact on those who deliver it, including physicians, nurses and the general staff of a hospital. Telemedicine has significant financial impacts and has been shown to be more efficient than routine care in the long run. Similar to high levels of patient satisfaction, studies show that most physicians are very satisfied with the use of telemedicine in their medical practice. This is mainly because the use of this kind of technology makes the process of treating patients more efficient and convenient. Overall, telemedicine has been shown to positively impact medicine in respect to patients and physicians by changing the way healthcare is delivered and received.

2.) Defining Telemedicine

Telemedicine is a complex term that entails many different aspects making it hard for any one definition to capture its meaning completely. Bashshur, Sanders & Shannon defined telemedicine as “the use of modern information technology, especially two-way interactive audio/video communications, computers, and telemetry, to deliver health services to remote patients and to facilitate information exchange between primary care

physicians and specialists at some distance from each other” (as quoted in Darkins and Cary 2000:2). A simpler definition of telemedicine was proposed by Wootton who defined it as simply: “health care carried out at a distance” (as quoted in Darkins and Cary 2000:2).

According to Field (1996), there are several different components of telemedicine of which only some apply depending on the organization implementing it. Therefore, there is no one concrete definition of telemedicine, but there are rather variations depending on which aspects of it apply to those using it (Field 1996). First, some feel that mentioning video conferencing or other specific means of telecommunications is pertinent in describing the concept. Even though this electronic mode of sending and receiving patient information from a distance is a key aspect of telemedicine, it only constitutes a small portion of it (Field 1996). Other acts such as analyzing and controlling information are also equally or sometimes even more important. This patient information may include details about the patient’s previous procedures, residence, prescribed medications, and hospital admissions (Field 1996). Second, telemedicine can apply to clinical along with non-clinical aspects of healthcare, depending on what is trying to be accomplished (Field 1996). Clinically, telemedicine can be used in the interaction between the physician and patient to allow for a comprehensive consultation and possible diagnosis. Other times, it can be used non-clinically to advise patients about their health such as in the form of electronically posting any pertinent information patients may need (Field 1996). Finally, an aspect of telemedicine that is almost always used in defining it is the fact that it is occurring over a distance (Field 1996). Connecting patients and their

healthcare providers by overcoming geographic barriers is the most important advantage of telemedicine and thus undoubtedly worth noting in its definition (Field 1996).

Often times the terms “telemedicine” and “telehealth” are used interchangeably even though they are distinct. Telemedicine is actually a subcategory of the larger concept of telehealth (Darkins and Cary 2000). The focused concept of telemedicine pertains to actual medical care including preventative health or curative procedures carried out by physicians themselves. On the other hand, the broader concept of telehealth includes telemedicine along with other healthcare services that consist of communication between the patient and any healthcare employee ranging from a nurse to a consultant (Darkins and Cary 2000). This may include services such as electronic medical records, electronic information and transmission of patient information. Physicians, however, are increasingly losing their autonomy and are collaborating more with other subspecialties including nurses, social workers and physician assistants (Darkins and Cary 2000). Therefore, it is not practical to use a term that solely focuses on only the physician’s part in the care of patients while ignoring all the others in an era of medicine that is increasingly becoming interdisciplinary. In addition, the curative aspect of medicine is expanding to now include giving information to patients and providing healthcare to those who are homebound (Darkins and Cary 2000). Ultimately, the combination of all of these factors is causing healthcare providers to slowly replace the term “telemedicine” with “telehealth” to include services that overlap with both concepts (Darkins and Cary 2000). Since most of the studies reviewed in this thesis pertain to direct consultations between the physician and patient, the term “telemedicine” will be used.

3.) History of Telemedicine

According to Lin and Atkin (2007), the revolution of telemedicine has been established for almost five decades now but has recently been developing very rapidly. Wittson and his team members are considered the pioneers of telemedicine as they initially utilized telemedicine in the context of medical care in 1959. Using microwave technology, they established teleconsultations in Nebraska, which allowed them to electronically communicate with another psychiatric hospital. Also in 1959, Jutra set up the first teleradiology center, allowing for the transfer of images between different locations. Telemedicine advanced very quickly for three decades following the 1960s as various projects appeared around the country (Lin and Atkin 2007). For example, in 1965, surgery was aired live for the first time when an American surgeon named Michael DeBakey visually transmitted a cardiac operation to Switzerland. While performing the surgery, he attended to any questions that were asked from physicians in Switzerland through the intercom (Darkins and Cary 2000). In 1973, the first national telemedicine convention was held in Michigan in which medical professionals debated the technological opportunities and economic restraints of telemedicine. The main focus of the conference was to plan a project at Logan International Airport in which a consultation would be carried out to another location in Massachusetts by live videoconferencing (Darkins and Cary 2000).

Unfortunately, for two decades following the 1970s, the growth of telemedicine collapsed because of the inadequate economic support for its implementation. Many companies believed there was not enough medical evidence behind its effectiveness and refused to fund its projects since utilizing technology was so expensive at the time. In

addition, since the technology was still in its developing stages, images and other patient information that was being transferred was not very clear (Darkins and Cary 2000). The 1990s was a decade that made all of the technology created during these pilot programs more efficient and manageable. For example, electronic files consisting of video and audio data could be made compatible, making it possible for them to be stored and read in a more effective and efficient manner. From 1990 to 1997, the number of telemedicine programs increased from 4 to 90, which then increased to over 200 by 1998 (Lin and Atkin 2007).

This rapid increase in the number of studies investigating the uses of telemedicine required a need to store and organize the results for future projects. There are currently several large organizations such as the Department of Defense that are working very hard to document and keep track of all these studies. In addition, various published journals on the World Wide Web serve as excellent databases for these studies while updating its content every year (Field 1996). There are several measures that can be studied in telemedicine. One of the most common types of measures used is patient satisfaction, in which researchers directly ask the patients about their impressions of receiving healthcare through the use of telemedicine.

4.) PATIENT

a.) Patient Satisfaction

With the growing popularity of telemedicine, measuring patient satisfaction is critical in identifying its effectiveness. Darkins and Cary (2000) propose that there are a variety of ways in which patient satisfaction can be measured in a clinical setting. The

most expedient way is through the use of questionnaires since they are inexpensive and can be easily arranged. In addition to simple questionnaires, in-depth interviews are also a common form of evaluation of patient satisfaction (Darkins and Cary 2000). This allows for a more expanded and subjective interpretation of what the patients' experience with telemedicine was like. It is critical for the researchers to use the same kinds of questions when administering surveys or asking interview questions to the population sample. Only then will the responses be consistent, allowing for any kind of meaningful comparative analysis surrounding telemedicine to be made (Darkins and Cary 2000).

Before examining this issue, it is first important to define what satisfaction is, since this concept is subjective. Whitten and Love (2005) defined satisfaction as when "an individual's expectations of treatment and care are met (295)." Most studies have shown that high patient satisfaction with telemedicine seems to be consistent with a particular demographic, specifically rural patients. In addition, telemedicine implemented in certain fields of medicine tends to bring about higher patient satisfaction than in others.

(i) Patient Satisfaction in Rural Patients

More than any other patient population, patients who live in rural areas show the highest satisfaction with using telemedicine. Nesbitt et al. (2000) showed this by examining the use of telemedicine in northern California by comparing the effectiveness, need and level of acceptance of telemedicine in remote and municipal healthcare settings. A total of 657 rural and urban patients were studied and were asked whether they would prefer seeing a specialist via telemedicine or by a face-to-face consultation (Nesbitt et al. 2000). Those patients who chose telemedicine were transferred to a clinic in which the

patient's physician provided the medical information to the corresponding clinician who carried out the teleconsultation. The patients were then asked to complete a questionnaire asking about their level of satisfaction by rating it 1-5, with 5 being the best, for statements related to their ability to communicate with the physician, readiness to have a teleconsultation again, and impression of how trained the employees were in using the equipment (Nesbitt et al. 2000).

Results showed that the majority of the patients from rural areas were very eager to have a teleconsultation again and would do so over the traditional face-to-face method. The patients were given consultations through telemedicine in a variety of fields. Patients from rural and remote areas showed a stronger preference for telemedicine than those in urban areas. The main reason for this was because telemedicine increased their ability to access care. Rural patients are faced with geographic barriers, requiring them to have long travel times, prolonging their ability to receive the necessary healthcare. This was especially challenging for patients who have families that require their presence (Nesbitt et al. 2000).

Greenwood et al. (as cited in Whitten & Love 2005) also found high patient satisfaction in rural patients. They showed that patients from rural areas repeatedly preferred telemedicine since they were able to avoid resorting to drive many miles in order to see their physician. The patients also agreed that this saved travel time compensated for having to give up the face-to-face interaction they would otherwise have had with their physician (Whitten and Love 2005).

(ii) Patient Satisfaction in Specialty Care

In addition to being useful in treating rural patients, telemedicine has also been identified as being beneficial in the care of patients seeking specialty care. For example, Lowitt et al. (1998) performed a study that examined patient and physician satisfaction with teledermatology in a VA hospital near Baltimore. The study lasted a total of two months and consisted of 139 patients. Two dermatologists consulted each patient first through video-conferencing. The physicians were able to control the dermatoscope from a different location in order to get a better view of the patient's condition. Shortly after, these patients were seen by the same dermatologists but through the usual face-to-face encounter. Patients were asked to complete questionnaires after the videoconference and face-to-face consultation. Altogether, six questionnaires were gathered from each patient where they were asked to choose the degree to which they agreed with various statements regarding both types of consultations. Such statements included "I felt comfortable talking with the doctor" or "I could hear the doctor well," etc. (as cited in Lowitt et al. 1998:471).

The patients had very positive impressions of both the videoconferencing and face-to-face consultations with the dermatologists. Even though satisfaction was expressed for both methods, results showed a slight increase in satisfaction for face-to-face consultations. However, when the patients were asked about their willingness to travel and see a dermatologist, they agreed that they would rather be consulted through video in their current location (Lowitt et al. 1998).

Today, psychiatric care is becoming increasingly more difficult to obtain, especially for children who live in rural areas. In response, many have proposed using

telemedicine by visually and audibly interacting between the pediatric patients and psychiatrists. To understand the effectiveness of telemedicine in the field of psychiatry, Blackmon, Kaak, and Ranseen (1997) of the University of Kentucky performed a study in which patients from Appalachian rural areas would have consultations with a psychiatrist using telemedicine. A total of 43 pediatric patients were studied and were transferred to an institution by their primary care physician. In addition, two psychiatrists volunteered to participate in this telemedicine study and received the necessary patient information from each patient's corresponding healthcare provider. Each session was 60 minutes long in which the psychiatrist interviewed the family and discussed any issues with the family's primary provider who was also present (Blackmon, Kaak, and Ranseen 1997). Following the consultation, the subjects completed a questionnaire about how they felt using the equipment and their level of comfort with communicating with the physician through video as compared to a face-to-face consultation. Finally, the subjects were asked if they would choose face-to-face contact instead of communicating with their physician through video (Blackmon, Kaak, and Ranseen 1997).

Since some of the patients were under-aged and incapable of completing the questionnaire, the data collected consisted of a mix of responses from both the parents and the patients. The results showed that all the subjects expressed high levels of satisfaction with having the teleconsultation (Blackmon, Kaak, and Ranseen 1997). More specifically, 96% of the respondents expressed that they were very comfortable during the consultation and could say anything they felt necessary to the physicians. In addition, 98% expressed that the staff was well trained in their fields (Blackmon, Kaak, and Ranseen 1997). Finally, 98% of the respondents also expressed that they had an overall

satisfaction with telemedicine and did not prefer the traditional face-to-face consultation (Blackmon, Kaak, and Ranseen 1997). All but one of the children who were capable of completing the questionnaire reported to having been comfortable during the consultation and readily able to honestly discuss issues about their mental health. Some of the children even reported it as being quite enjoyable and thought of it as “being on TV” (as quoted in Blackmon, Kaak, and Ranseen 1997) rather than being clinically assessed. Overall, both the parents and children were very satisfied with the use of telemedicine and reported being quite comfortable when discussing an otherwise very sensitive topic such as their mental health (Blackmon, Kaak, and Ranseen 1997).

Feedback from telemedicine is not always positive but rather brings about certain concerns that inevitably are associated with implementing such new technology. One possible reason for negative satisfaction is uneasiness about the strength of confidentiality when using telemedicine. As compared to speaking with a physician behind closed doors face-to-face, electronic communication is not as visibly secure. Along with the issue of confidentiality, some patients also reported having less personal interaction with their physicians when using telemedicine. This makes sense because a face-to-face interaction is something invaluable when it comes to diagnosing a patient. Even though video technology makes it possible for both parties to visually see each other, the physician’s ability to assess body language and maintain the same level of personalization that is involved in being in the same room with a patient is undoubtedly lost (Whitten and Love 2005).

Blackmon, Kaak, and Ranseen (1997) also identified some level of dissatisfaction in their study of telemedicine with mentally ill patients. For example, 28% of the adults showed strong agreement in that they did not feel fully comfortable with the consultant during the telemedicine consultation. In addition, 24% expressed that they felt “embarrassed” when communicating with the physician through video. Unfortunately, the authors did not specify as to why the patients felt this way (Blackmon, Kaak and Ranseen 1997).

(iii) Limitations of Measuring Patient Satisfaction

Although surveys, questionnaires and systematic reviews of other studies provide great tools to identify levels of patient satisfaction with telemedicine, they have several limitations. First, Whitten & Love (2005) identified patient bias as one of the largest limitations in accurately measuring patient satisfaction. For example, sampling a population of patients who live in rural areas far from a hospital or those that are receiving care for free are more inclined to show stronger satisfaction than other patients. This is because they benefit more from the use of telemedicine since they have increased access to cheap and available care that they would otherwise not have (Whitten and Love 2005).

Second, certain aspects of the experimental design itself may actually be another limitation in studying patient satisfaction. For example, Nesbitt et al. (2000) noted that although their study offered some strong subjective feedback from the patients and physicians, the samples drawn were not done so randomly. In addition, not every patient completed a questionnaire but rather only a select group did. Mair & Whitten (2000) also

addressed sampling issues. They found that many of the studies they examined in their review contained very small populations, with some being as low as 20 patients and of those who were interviewed only a small portion had responded. Also, the basic methods by which the participants were selected were not explicitly mentioned, allowing for possible biased opinions in their responses to the surveys (Mair and Whitten 2000). Finally, some studies did not even contain a control group in which patients would receive a consultation only through face-to-face contact. Therefore, often times, there were no standards for results from those in the telemedicine group, eliminating any ability to accurately compare patient satisfaction among different consultation methods (Nesbitt et al. 2005).

Finally, according to Mair and Whitten (2000), studying patient satisfaction can be difficult since each patient finds different aspects of his/her healthcare to be satisfying. For example, a rural patient may find high levels of convenience as a determining factor in how satisfied using telemedicine might be since he/she does not have as much access to healthcare. On the other hand, patients who are focused on the quality of their healthcare may be more sensitive to how technologically effective the telemedicine may be in accurately diagnosing and treating a patient. This consequently skews the level of validity in many of these studies since asking patients how “satisfied” they are with telemedicine may not exactly be a true measure of patient satisfaction. Many of these studies also only represented a cross-sectional analysis of the patients’ satisfaction with telemedicine, but failed to express whether their views had been modified in the long-run. Therefore, in order to improve the validity of these results, a longitudinal study in which

patient satisfaction before and after repeated uses of telemedicine would be much more representative (Mair and Whitten 2000).

Ultimately, due to these shortcomings and the fact that there are still very few studies done in telemedicine, it is not reasonable to conclude that the use of this kind of technology will always result in patient satisfaction. Rather, more concrete research needs to be done in order to establish any kind of definitive conclusion. At best, these reviews of various studies and the studies themselves can only serve as a guide or possible indicator of the direction in which telemedicine is going rather than an ultimate cause and effect relationship (Mair and Whitten 2000).

b.) Medical Outcomes in Patients

Like patient satisfaction, the benefits of telemedicine in the health outcomes of patients are not always consistently measured in the same way. Although each study that assesses this uses a different measure, common health measures include hospitalization rate, blood pressure, glucose and HbA1c levels, morbidity, and basic physical examination results (Hersh et al. 2001). The measure that is chosen depends mostly on the type of patients being studied and the medical issue at hand before the study began. For example, the status of diabetic patients is often monitored by measuring their HbA1c and blood glucose levels whereas researchers are more interested in the blood pressures for hypertensive patients (Hersh et al. 2001).

(i) Cardiology

Telemedicine has been very successful in improving health outcomes of patients in some fields more than others. Hersh et al. (2001) conducted a systematic review in which 8 studies were chosen out of a total pool of 4,628 studies identifying the level of medical effectiveness using telemedicine. Only those studies were chosen that implemented telemedicine in either the home or hospital and did not utilize the store-and-forward system, which is when telemedicine is not practiced in real-time. In a store-and-forward system, patient information such as images is sent to the physician who then will return feedback when he/she has the opportunity to do so. Upon review of the studies, the authors found that cardiology patients seemed to have most benefited by telemedicine in giving a comprehensive patient history and gaining a physical examination. This included obtaining information such as previous illnesses, current medications, type of lifestyle and any pertinent personal information. Aspects of the physical examination included heart rate, blood pressure, and pulse oximetry (Hersh et al. 2001).

Another study to further support the benefit of telemedicine in the health of cardiology patients was done by Rendina et al. (2009). This study examined the effectiveness of telemedicine in the context of performing urgent readings of neonatal echocardiograms in the NICU. In particular, the researchers sought to evaluate how the use of telemedicine would affect the length of stay for these critically ill infants who were severely underweight. In the 6 months of study, telemedicine was implemented in the form of echocardiograms. The researchers found that the infants studied during the 6-month period with the implemented telemedicine of echocardiograms stayed 5.4 fewer days in the NICU as compared to those who were not admitted with this technology.

Despite the fact that the study examined a relatively small sample size, the researchers were able to show that using telemedicine in the NICU is both medically and financially advantageous in treating these patients (Rendina et al. 2009).

(ii) Diabetes

Telemedicine has also been shown to be very effective in managing patients with certain chronic conditions that require continuous follow-ups and care such as diabetes. According to the American Diabetes Association, there are currently 25.8 million individuals in the United States who have diabetes, which is equivalent to 8.3% of the entire country's population. Furthermore, diabetes is recognized as being responsible for 71,382 deaths and factored in 160,022 deaths. Diabetes is also the primary cause for kidney failure, blindness, and hypertension in individuals between the ages of 20-74 (American Diabetes Association 2011). Therefore, diabetes is currently a growing problem in the United States and is especially difficult to manage for patients who live in rural areas or those who simply cannot access the healthcare system because their health has left them homebound.

It is very important for diabetic patients to document their glucose levels and report this information to their physicians. This not only gives indication of the progression of the diabetes, but will also allow for the physicians to make decisions in altering the patient's treatment plan. The main issue with this is that patients do not have an efficient way of transferring this recorded information to their providers. Currently, most patients are asked to manually write down their blood results in the form of a personal table. This information is usually not reviewed by the physician until months

after it is obtained. In order to address these issues, telemedicine has allowed for new tools to make the process of managing diabetes easier and more effective. For example, *GlucoTel* is a blood glucose monitoring system, which consists of a handheld device that measures the patient's glucose levels. This information will then be electronically transferred to a mobile phone, which would then update these results to a patient online database. With *GlucoTel*, physicians have full access to these live updates of patient information, eliminating the need for patients to manually record their glucose levels and physicians having to wait long periods of time before having access to it (Schwarz 2010).

Telemedicine has also been shown to be beneficial to specific diabetic populations who are more prone to serious complications if not treated. Dalfra et al. (2009) examined the impact telemedicine had on diabetic pregnant women, with a particular focus on their fetus. The researchers studied 276 women, of which two groups were established. One group of women used telemedicine while the other group did not. The women who belonged to the group using telemedicine electronically forwarded their blood glucose levels weekly. On the other hand, those patients in the control group were required to submit a similar report biweekly (Dalfra et al. 2009).

To measure the effectiveness of telemedicine in both groups, the researchers used questionnaires that monitored quality of life and levels of stress caused by the diabetes. Although the discrepancy was subtle, the use of telemedicine improved the metabolism status of pregnant women especially during their third trimester. In addition, according to the quality of life questionnaire, women who used telemedicine had a more positive and optimistic outlook on their condition than those in the control group (Dalfra et al. 2009). Another significant finding was that the patients in the control group required more

follow-ups for their diabetes than those in the telemedicine group. Overall, the patients who used telemedicine had a more successful pregnancy and health compared to the diabetic pregnant women who used the standard level of care (Dalfra et al. 2009).

Aside from patients, the other key player used in measuring the effects of telemedicine is the provider. Most often as physicians, the provider is responsible for diagnosing and deciding the proper treatment for the patient. A major medical intervention such as telemedicine will significantly affect this clinical process. This makes it important to analyze its effects on physician satisfaction and the hospital itself in which telemedicine is being used.

5.) PHYSICIANS

a.) Financial Benefits of Telemedicine

Before measuring the level of cost effectiveness of telemedicine, it is first important to define the key concepts. Cost is a measure that quantifies the value of a particular supply used with the introduction of a practice such as telemedicine (Field 1996). Cost effectiveness is a qualitative or quantitative way of comparing costs and the kinds of benefits telemedicine will have on the health of the patient. This kind of benefit can be measured in a variety of ways, in a grand scale such as lifespan or grounded scale such as blood pressure or glucose levels. It does not make practical sense to say that telemedicine is a worthy investment since its monetary benefits are dependent upon a variety of factors (Field 1996). The question that should rather be asked is whether telemedicine is beneficial for a particular health issue as compared to traditional methods

of care. The costs that are calculated in this process are those that are inconsistent between the two (Field 1996). For example, if using teleradiology in a particular hospital will still require the same task force and building, the costs incurred for those factors will not be taken into account. However, the cost for the radiologist to actually come to the hospital to read an image that would not be incurred if he or she could read it directly from home via telemedicine would be accounted for in the cost benefit analysis (Field 1996).

Telemedicine has been shown to be economically beneficial in the management of chronic diseases. The healthcare system in the United States is designed in a way in which patients with acute problems are treated with efficiency. However, the system is less efficient in managing chronic diseases, which is a rapidly growing problem in our population today (Prevention Intervention Innovation 2011). Statistically, the cost for treating a patient with multiple chronic diseases is five times those with only an acute health issue (Prevention Intervention Innovation 2011). Furthermore, for every \$4 incurred in providing care in general, \$3 of that amount is solely spent on the management of chronic conditions (Prevention Intervention Innovation 2011). In respect to the specific chronic diseases, heart disease and stroke incur the most, costing a total of \$432 billion annually with diabetes ranked as second, incurring \$174 billion annually (Prevention Intervention Innovation 2011).

With rising healthcare costs and the high number of uninsured Americans, new systems of care are being reviewed such as telemedicine in the hope of increasing its efficiency in managing chronic diseases. A randomized controlled trial conducted by Johnston et al. (2000) of Kaiser Permanente studied the cost effectiveness of home care,

specifically with the use of videoconferencing. The researchers collected a random sample of patients who met a specific criterion of chronic diagnosis including but not limited to COPD, diabetes, and anxiety. Their providers at home visited both the patients from the telemedicine and control groups with the exception that the telemedicine group also utilized video technology. This system gave the patients the ability to communicate with the nurses live and transmit cardiopulmonary information. The study revealed that the total cost without the costs of the overlapping home health care shared by both groups was \$726 higher for the control group than the telemedicine group, or 27% more expensive. Overall, the use of video to supplement the care for these homebound patients proved to be significantly cost effective as compared to without it (Johnston 2000).

In addition to managing chronic diseases, telemedicine is also economically beneficial in the treatment of patients who live in remote locations. About 20% of the total American population lives in rural areas (Pantojan 2012). Even if these patients can afford to make their appointments, they still may not be able to because of how long it takes for them to reach their physician. According to a survey, 14 percent of patients from rural areas had to travel at least 30 minutes to access healthcare. On the other hand, only 10 percent of patients from urban areas traveled this same amount of time (Health Reform 2011). By not completing their recommended annual physicals and routine tests, the chance of a diagnosis being too late for these patients significantly increases (Patient Advice and Liaison Service 2011). Ultimately, without any proactive measures, low-income and rural patients are put at higher risk for developing conditions that could have been prevented.

Agha et al. (2002) showed the cost effectiveness of applying telemedicine to rural patients with chronic disease, with more of a focus on pulmonary care. Patients were placed into three groups in which they received pulmonary consultations either with telemedicine, traditional face-to-face interaction or homecare visits. Those in the telemedicine group consulted with their physician who was located at the VA hospital in Milwaukee (Agha et al. 2002). In the home itself, a nurse was present with the patients to assist them in using the equipment and answering any questions they may have had. Those who received the traditional care were seen by the physician at the hospital and were consulted using all the equipment in the office itself. Finally, those who received homecare were actually visited by their physician and underwent a consultation directly in their own home (Agha et al. 2002). The researchers found that the cost of consultation per patient performed by telemedicine, traditional care, and homecare were \$335, \$585, and \$1,166, respectively. In other words, using telemedicine in consultation with these patients was \$272 more cost effective than doing so by traditional care. Therefore, it was concluded that providing care to these rural patients through the use of telemedicine was the most cost-effective approach as compared to the other treatment options (Agha et al. 2002).

Just as rural populations are often faced with challenges in accessing the healthcare system, prisoner populations are believed to have an even more difficult time. According to the eighth amendment, prisons are required to provide healthcare for their prisoners since not doing so would be considered as “cruel and unusual punishment” (Justis 2011). The demographics of prisoners in the United States seem to have shifted towards an older population of criminals spending longer times incarcerated, thus

requiring more healthcare than ever before. In addition, most prisons are built in isolated regions, making transportation to a hospital or clinic much more of a challenge. Not only does it require more time for these patients to reach their destination, it is also very expensive given the need for security officials to travel along with them (McDonald 1999).

Implementing telemedicine into prisons would provide significant cost benefits to the prison institutions and healthcare industry altogether. The first source of savings would be associated with the prison itself, as they would no longer need to transport these prisoners to and from the hospital (Justis 2011). Second, if implemented correctly, telemedicine has the potential of improving the health outcomes of these prisoners. Consequently, the nearby hospitals will experience a lower admission rate of these prisoners, allowing them to allocate their resources to other patient populations. In addition, many of these prisoners are admitted for having various diseases that can be easily transmitted. By being admitted less often, these prisoners would thus decrease the overall transmission rate of their communicable disease in the hospital, thus saving overall healthcare costs as well (Justis 2011).

As it is very common today in the US population, diabetes is also prevalent and an equally growing problem in the current prisoner population. Approximately 4.8% of prisoners are diagnosed with diabetes, requiring effective and long-term care in order to manage the condition. Adequate management of diabetes involves having frequent access to healthcare at the onset of symptoms in order to prevent any permanent complications (American Diabetes Association 2006). Since most prisoners are located in rural areas and are more expensive to transport to hospitals, Aoki et al. (2004) studied the cost

effectiveness of using telemedicine in prisoners with diabetes, more specifically those who developed retinopathy as a secondary complication. In their study, one group of prisoners received treatment through teleophthalmology while the control group did not. The researchers found that the QALYs (quality-adjusted-for-life-years) for the patients in the teleophthalmology group had an increase of 0.15 average QALYs than those in the control group (Aoki et al. 2004). Furthermore, the cost to care for the patients in the teleophthalmology group was \$1,076 cheaper than those in the control group. Therefore, this study showed that the use of telemedicine in treating these diabetic prisoners was significantly more cost effective since it cost less and provided a more positive health outcome than not using it (Aoki et al. 2004).

Although many research studies are being done in telemedicine and its cost effectiveness, there is still not enough substantial evidence in order for insurance companies to cover its usage. According to Darkins and Cary (2000), there are three main criteria which telemedicine would have to meet in order for it to be considered a strong alternative to the traditional strategies of healthcare. First, there needs to be a market for its usage in which physicians and clinics nationally are willing to accept it into their own practice. This is important because if telemedicine is only being implemented in healthcare facilities in a particular region, then insurance companies will be less likely to cover it since not all of its members will have access to it. Second, there needs to be a sufficient number of evidence-based studies that adequately show that telemedicine is cost effective and is worth the investment. Finally, interest groups need to continually show strong support for its implementation through lobbying in the government. Ultimately, purchasers such as insurance companies must provide coverage for any

services that the government mandates them to. Therefore, by being able to directly pitch the ideas surrounding the benefits of telemedicine to the legislators, lobbying would heavily influence its implementation (Darkins and Cary 2000). In March 2010, government officials in Virginia passed a law requiring insurance companies to cover the use of telemedicine in providing healthcare for patients. Virginia is currently one of twelve states in which telemedicine is covered for types of visual and audio communications, or any other types of electronic technology that are used in the care of a patient. Telemedicine is therefore slowly being accepted across the country in providing health care to patients of all groups (FierceMarkets 2011).

b.) Provider Satisfaction

Provider satisfaction has been evaluated significantly less than patient satisfaction because most people believe that if the patients are satisfied, then everyone is satisfied. This is not the least bit true since provider satisfaction contributes greatly to how effective and efficient any kind of medical treatment is when delivered. For the most part, the hospital boards consist of some of the current providers of that facility and are the ones that make judgments of whether a system change should occur or not. It is also critical for providers to be in favor a new technological system such as telemedicine in order for it to be actually implemented in the clinical setting itself (Field 1996).

Most often when evaluating provider satisfaction, researchers are questioning the actual physicians themselves who are involved in the direct care of patients. There are a couple key elements of a physician's profession that if met, will lead to high physician satisfaction. It is important to note that these aspects may not apply to every physician but

do pertain to most (Shanafelt et al. 2008). First, most physicians would like to experience “professional development” or the ability to adopt leadership positions in educating others about an area of medicine that may serve to benefit their roles as healers (Shanafelt et al. 2008). Second, physicians strive to serve as many patients as possible to the best of their ability. Although many patients today in the United States do not have access to the care they need, the gratitude that is delivered from the ones that are served are both rewarding and comforting to physicians (Shanafelt et al. 2008). Another critical determinant in provider satisfaction is how flexible and comforting the lifestyle of a physician is. Most physicians work long hours while still trying to maintain a family. This is very difficult since they are often called into the hospital during late hours of the night. All of these principles that guide provider satisfaction can be modified with the use of telemedicine. Finally, physicians would like their equipment to function properly with as few technical difficulties as possible (Shanafelt et al. 2008).

(i) Satisfaction With Convenience

Each field of medicine requires its physicians to spend a different amount of time with its patients and allow for different levels of flexibility. Over the past decades, physicians have not necessarily needed to lengthen the time of their consultations but rather have had more information to convey to their patients. Examples of this information may include possible treatments, side effects of medications, and discussions about the patient’s lifestyle (Pho 2011). According to a study done by Trude (2003), physicians are reporting an increase of stress in their medical practice. This is because they cannot devote the time required for each patient because of the sheer volume of

patients they have to see in order to earn the revenue they need to survive in their practice. Over the course of four years between 1997 and 2001, the percent of physicians reporting difficulty in spending time with patients increased from 28% to 34% (Trude 2003). Blendon et al. (2002) found that 72% of the physicians they interviewed believe that this reduction in consultation time is the source for many of the medical errors that are made today. Furthermore, 78% of the physicians believed the frequency of medical errors would be avoided if the physicians were with the patients longer during the consultations and discussed more in depth about treatment options and various warnings the patients should be aware of (Blendon et al. 2002).

With the use of telemedicine, physicians are finding it possible to still spend the same amount of time with their patients while still conveying the information they need to their patients in an effective manner. In addition to simply relaying this information, telemedicine also makes it possible for patients to communicate directly with their physician and ask any questions they may have about their treatment plan (Fox 2006). Many physicians have also begun posting any information they deem necessary for their patients to know on the Internet either on public or private databases. This makes it easier for physicians since the patients already may have insight into their medical problem. Therefore, the patients will better comprehend any recommendations or explanations the physicians may have to offer, making the consultation more effective (Fox 2006).

Telemedicine also has the potential of increasing convenience for physicians since it can allow them to order, read, and transfer various clinical tests with much more flexibility. The most known example for this is in the field of teleradiology in which radiologists can now receive patient images directly to their home computer and submit

their feedback within minutes (Thrall 2007). Before the establishment of this kind of image transferring, radiologists would have to actually commute to the hospital and personally receive the images. In addition to reducing travel time, teleradiology also solves the problem of radiologists receiving more images than they have the time and resources for. Since the images can be sent virtually anywhere electronically, radiologists from all over the world can receive these images. By outsourcing these images nationally and even internationally, hospitals would decrease the stress on its radiologists and allow them to focus on the work they are already given with accuracy. This would be beneficial for both the physician and the patient since it will lead to fewer medical errors and a more positive work environment (Thrall 2007).

(ii) Satisfaction With Equipment

Similar to the patients, the physicians also showed high levels of satisfaction in the study done by Lowitt et al. (1998) with both the videoconferencing along with the face-to-face consultations. More specifically, physicians showed satisfaction for 81% of the consultations using videoconferencing as they did for having face-to-face consultations. However, the authors did not state what aspects of the videoconferencing were appealing to the physicians. The nurses also showed high levels of satisfaction as they reported that the physicians and patients were able to communicate with no problem throughout the consult (Lowitt et al. 1998).

However, even with high satisfaction, the physicians did have some complaints about the effectiveness of the equipment in consulting with the patient. For example, the hand-held dermatoscope did not provide as effective results as the flexible scope. Also,

since there were slight issues with the connectivity in the video transmission between the physician and patient, both groups expressed the essential need for an improvement in the technological aspects of telemedicine before it is widely used (Lowitt et al. 1998). Second, the physicians did note a couple issues with the video concerning their ability to accurately view the whole patient. For example, it was difficult to get a complete view of the lower extremities including the legs and feet. When they were able to zoom the scope to an area they needed, the physicians reported that they were not able to effectively focus it with precision. Finally, simply viewing and not being able to touch the patient restricted the dermatologists in their ability to accurately diagnose the patient with the same level of confidence as they usually would (Lowitt et al. 1998). The researchers in this study made a note to the limitations, with particular focus to the fact that only a few physicians had participated. In addition, since these physicians were all part of the same group practice, it is very likely that they shared similar impressions of telemedicine because they worked in the same medical environment and had the same level of expectations. For example, these physicians shared the same type of equipment and saw the same type of population. Therefore, it would be expected that any kind of intervention that would change their practice would be received similarly (Lowitt et al. 1998).

Nesbitt et al. (2000) also found mixed impressions of telemedicine from the physicians questioned. For each aspect of telemedicine, all 204 physicians in their study rated their level of satisfaction from 1-5. The average score with the general use of telemedicine was 4.3/5. Level of satisfaction dropped below 4/5 for one aspect of primary care, which was rheumatology (Nesbitt et al. 2000). Unfortunately, the authors did not state as to why this particular aspect did not receive the same level of satisfaction as the

others. In addition, the physicians reported some type of problem with the technology in 20% of all the consultations they had using telemedicine. These difficulties included unanticipated lag between communication and periodic inability to modify the image to provide for a clearer view (Nesbitt et al. 2000).

6.) Conclusion

Telemedicine is a revolution more than simply a process that is being developed in more healthcare settings each year. Medical gadgets that once seemed unimaginable are becoming tangible. For example, a medical robot called the *RP-7i* is now being used in the ICU to attend to serious stroke patients. The robot is fully equipped with a monitor, camera head-shaped top that can move in all directions, and sensitive microphone that can amplify the voice of the patient and physician. In addition, the robot has three wheels underneath its platform, which under the physician's control, can move swiftly through the hallways of the ICU and attend to patients promptly. The day has finally come in which physicians are treating patients from miles away and are taking form in the bodies of robots (Geer 2010).

Although telemedicine has shown to have widespread benefits both clinically and financially to those involved in the healthcare process, it is important to realize that it has its limitations. Many argue that telemedicine loses the interpersonal connection and benefits from the physician and patient communicating face-to-face. Although the synchronous sources of telemedicine such as videoconferencing will still be able to partially maintain this level of personalization, the asynchronous and store-and-forward sources will lose it completely (Wallace et al. 1999). Another potential issue with

telemedicine is maintaining the same level of confidentiality. Electronically transferring confidential medical records makes it more difficult for physicians and healthcare employees to preserve the identity of patients. With the stringent rules that exist in the United States, it is imperative for both legal and social reasons that all patient information is exposed to only those who should have access (Wallace et al. 1999). In order to assess these issues and generate solutions for them, more information needs to be gathered from those that have or are currently using telemedicine. My research question is just that and entails what physicians and patients feel about the effectiveness and efficiency of telemedicine. In almost every study I have analyzed, there is a disclaimer that states that more studies need to be done in analyzing the effects of telemedicine. This is because the technology used in this field is still very new and is constantly developing, thus requiring an updated status about how the physicians and patients are responding to it. In my study, I intend to contribute to this pool of research surrounding physician and patient impressions of the use of telemedicine by conducting face-to-face interviews.

Chapter 2: Methods

The focus of this study was to explore provider and patient satisfaction with the use of telemedicine in the delivery of healthcare. I gathered insight into providers by interviewing a general practitioner and two nurses who use telemedicine. For patient's views, I interviewed three patients who currently use telemedicine frequently to interact with their healthcare providers. Therefore, all participants in this study were familiar and had significant experience with the use of telemedicine in various aspects of healthcare. I obtained formal approval from the Human Subjects Committee of Union College to carry out these interviews.

1.) Sampling Population

Altogether, 6 participants were interviewed for this study. Using convenience sampling, I first interviewed a general practitioner who uses basic telemedicine operations with his patients. In addition to interviewing him, I interviewed three of his patients who currently use telemedicine in regards to the transmission of their medical information. All of these patients currently have a small unit in their homes, which allows them to have real-time audio and video communication with their case nurses. In addition to allowing for communication, this unit transmits medical information including blood pressure, oxygen levels, weight, and heart rate. The first patient interviewed is a middle-aged male with a disability and various cardiac-related issues, including high blood sugar. The second patient is a middle-aged female who suffers from a chronic lung condition and is on a daily ventilator at all hours of the day. Finally, the last patient is an elderly female who has severe dementia and is looked after by family. All of the patients

interviewed have been selected to have these units in their homes because they have some kind of serious and chronic condition that has left them homebound and in need of daily monitoring.

I also interviewed a nurse at the facility that monitors the incoming medical information from these devices. At this facility, each computer would alert the nurse every time a patient would send his/her readings. Furthermore, a special alert would appear if one of the readings was irregular, which in that case the nurse would call the patient and possibly send over medical assistance to check on the patient.

Finally, I interviewed a nurse who works for a telemedicine program that holds videoconferences once a month with providers in various facilities in the northeast. The purpose of this program is to electronically provide information about the most recent and advanced methods of treating communicable diseases to locations that are geographically isolated.

2.) Research Instrument

Interviews seemed most appropriate for my study rather than an administered survey. By interviewing the patients and asking open-ended questions, I had the opportunity to ask for any kind of clarification if needed. Each patient interview was performed face-to-face and took place in his/her home. On the other hand, only one of the provider's interviews was performed face-to-face while the other two were done over the telephone due to a convenience issue. Prior to each interview, I notified the participants that they were not compelled in any way to take part in my study and that their involvement was voluntary. I also made it clear that their identity and responses to the interview questions would remain confidential. All of this information was stated in the

consent form, which I asked them to sign before the beginning of each interview. Finally, I asked the participants if I could record the interview and notified them that they could tell me to stop recording the interview at any time. Each interview varied between 10-15 minutes, depending on how much each participant had to contribute in answering each question. The interviews with the providers tended to last longer than the interviews with the patients, because the three patients I interviewed had one or more debilitating chronic conditions, making it impractical to expect any kind of extensive response. Confidentiality was maintained in interview process, as I was the only one with access to the recording and transcripts of each interview, except for my thesis advisor.

Although the content of the interview questions were different for the providers than for the patients, each interview contained the same format. The first component consisted of a series of statements regarding the satisfaction with various aspects of telemedicine where each participant was asked to rate his/her level of agreement from 1-5, with 5 being “strongly agree.” The second component consisted of a series of in-depth questions, which asked the participants a more subjective response to questions related to their impression of the use of telemedicine. The list of interview questions and consent form are included in the appendices.

3.) Analysis

For each statement that the participant was asked to rate from 1-5, I tallied the frequency of how many of the participants responded with each number. I compared which statements received the highest level of agreement to those that received the least. This was done separately for the providers than for the patients since each group was given a different set of statements. I also did this for the in depth questions in terms of

how many participants said “yes” or “no” to each question. However, I qualitatively analyzed any further details the participants may have provided to each in-depth question individually. Finally, I compared my findings to what I had learned from the literature review.

Chapter 3: Results and Discussion

1.) Introduction

The goal of this thesis was to further investigate how particular examples of telemedicine can affect satisfaction. By interviewing both patients and providers, I was able to obtain a greater understanding about what both sides think are the strengths and weaknesses of using telemedicine in the delivery of care. The use of telemedicine cannot be simplified into a narrow range of services, but is rather one that consists of different forms of technology and caters to a wide range of patients. When choosing and applying telemedicine, I found that patients and physicians look for different qualities in the type of technology according to what would best suit them. Patients most often prefer an increase in convenience and comfort by using their telemedicine devices. This includes user-friendly equipment, which they can use in their own homes without the assistance of others. On the other hand, I found that providers are most often focused on achieving an improvement in their patients' medical outcomes and reducing hospitalization rates that would significantly cut medical costs. Along with this, providers wish to reduce the need for regular home visits, as this is also very expensive. Overall, I found that the level of convenience, physician/patient relationship, medical and cost effectiveness associated with their use of telemedicine were most significant in determining patient and provider satisfaction.

2.) Patient Responses

All three patients who were interviewed have been using a home-installed telemedicine device throughout the progression of their chronic conditions. This device

audibly instructs the patients how to take each reading once a day and transmits the information electronically to an off-site medical center. Overall, all three patients found the device to be convenient and preferable in the use of their healthcare compared to visiting their physician. However, the patients reported the device to have certain limitations including its limited features in adapting to individual needs and losing the personal interaction with their provider.

a.) Strengths

(i) Convenience

The first distinctive result from their interviews was that they strongly agreed with statements regarding convenience and in fact, reported this as being the best part of using telemedicine. When asked about this, all patients strongly agreed they preferred using units rather than leaving their homes to see their physician. Patient 1 described it as an “excellent thing to have,” because it is in her “living room and doesn’t have to leave the house.” Similarly, patient 2 said it is “nice to be able to find out your blood pressure and weight when you want to.” Finally, the husband of patient 3 reported that it was “very easy” to help his wife. He also mentioned he was thankful, because “she can stay put in her chair and not have to get up for any visits.”

This finding relates to what was found in the literature about the inability for certain patient populations to access healthcare. Nesbitt et al. (2000) found access problems due to location. Out of the 657 rural and urban patients interviewed, the majority of the rural patients was very willing to use telemedicine again and would do so over traditional care. Like those patients, the patients in my study also did not have access, but differed since their condition rather than location had left them homebound.

The homebound patients in my study also preferred telemedicine since it was most convenient given their situation.

b.) Weaknesses

(i) Compatibility

Although all patients stressed the convenience, two of the patients did note certain technical aspects they would change if possible. Patient 1 noted that the device occasionally reported the wrong time on the screen, which tends to “throw him off,” because he is asked to measure and electronically send his vital signs at the same time every day. Another complaint he had was that the voice, which instructs him to take each vital sign, is very loud. Since the patient was never given any instructions as to how to decrease it, this became very frustrating. The patient is severely overweight so he also complained about the blood pressure cuff being inadequately sized to fit around his whole arm. This is a major problem since it may lead to an incorrect blood pressure reading at times. Similarly, he is not able to take his weight properly since the scale is not equipped to fit the wheelchair he requires. Patient 2 also reported having a couple difficulties in using the actual unit due to her arthritis. One in particular was the issue of reconnecting the unit back into service, which consists of pinching the wire inside and out of its socket. Since her fingers are weak, she cannot accurately reconnect the telephone cable without feeling pain in her hands. Although effective, the device is not completely compatible for easy use by some of these homebound patients.

Interestingly, patient dissatisfaction with technical aspects of telemedicine was not found in my literature. The only aspect of telemedicine that seemed to be of concern

for patients was the confidentiality and how comfortable the patients felt in exchanging medical information electronically (Whitten and Love 2005). Other than this, the literature showed that the patients had easy-to-use devices and some also had a nurse that helped assist the patients with using the technology (Agha et al. 2002). The issues the patients in my study had were related to the basic connectivity of the home device, of which a nurse could not help with every time.

(ii) Not as Personable

Finally, all patients strongly disagreed with the statement that telemedicine was as personal as face-to-face consultation. The alternative to telemedicine in this case for the patients would be the physician or visiting nurse to actually come to the patients' home and measure all of these vital signs for themselves. Therefore, even with the loss of personal interaction, the patients stated they have no better option. Although the patients did not explicitly state that this was a negative aspect of telemedicine, I imagine that it is based on the literature such as in the study by Whitten and Love (2005).

In the study by Whitten and Love (2005), the patients who used telemedicine reported having less personal interaction with their physicians. By losing the ability for them to physically be with their physicians, these patients' medical progress was strictly being monitored by vital signs that were electronically being transferred to the hospital. Since the device used with the patients did not even have video conferencing as did the patients in the Whitten and Love (2005) study, this level of personalization is further lost (Whitten and Love 2005).

3.) Provider Responses

The interviews with the providers proved to be insightful, because they have more experience with using different types of telemedicine with their patients and are able to assess the outcomes. All three of the subjects interviewed strongly agreed that they were satisfied with the overall use of telemedicine with their patients. The providers also showed strong satisfaction with the level of medical and cost effectiveness with the use of telemedicine. However, they showed somewhat less satisfaction with the level of quality in the technology used and its ability to apply to a broader patient population.

a.) Strengths

(i) Efficiency

The benefits of telemedicine largely depend on the type of healthcare organization and the patient population it is targeting. For example, the home-care physician found telemedicine to be efficient in communicating with patients along with an interdisciplinary team. Technology such as videoconferencing would allow for a physician, nurse practitioner, nurse and social worker to all participate simultaneously in communicating with a patient. According to him, this makes healthcare efficient, allowing the care team to resolve an issue without having that patient be admitted to the emergency department.

Along with allowing for an interdisciplinary team to care for the patient, the subjects expressed that the use of telemedicine simply saves time and money for visiting home care nurses. During these home visits, the nurses primarily measure vital signs and perform an overall assessment of each patient's health. With a telehomecare monitoring device such as the ones the patients in this study used, these vital signs can be self-

assessed and transferred to the providers in their offices. Therefore, in the event that the patient does experience any health complications, the nurses will visit the patient in his/her own home and make a trip that is actually necessary. This was also found in the literature, such as in the study by Johnston et al. (2000). The researchers in this study found that the cost of care for patients with chronic diseases such as COPD, diabetes, and anxiety was \$276 higher in the group of patients in the control group as compared to those who used telemedicine. This is because these patients had to be visited by their physicians in order to be assessed. On the other hand, the patients who used telemedicine were monitored while staying in their own homes. Although these patients in this study used videoconferencing in their treatment, their health was still monitored electronically (Johnston et al. 2000) as was true for the patients who were interviewed for this study.

The provider interviewed who uses telemedicine to transmit information for educational purposes also reported it as being efficient. With the use of telemedicine, these providers are able to successfully transmit clinical information to physicians across vast geographical areas. This is much cheaper and faster rather than the providers having to travel to the physicians and educate them personally. A similar finding was also in the study by Justis (2011) as it showed that implementing telemedicine into prisons allowed for both the prison institutions and healthcare industry to save money altogether. The largest source of saving would be contributed to the fact that security guards would not have to be arranged to come along with the prisoner. In addition, many of these prisoners are admitted for having various transmissible diseases. If information can be electronically sent to virtually educate prison officials in how to prevent the spread of disease, nearby hospitals will experience a lower admission rate of these prisoners, which

allow these hospitals to allocate their resources to other patient populations and prevent further transmission (Justis 2011).

(ii) Medical Effectiveness

Along with cost effectiveness, all three providers felt that the use of telemedicine plays a significant role in reducing their rehospitalization rate. By providing constant monitoring of the patients' status such as with the telehomecare device in each patient's home, nurses and physicians are able to detect the progression of health. In the case of a decline in status, proper measures can be taken to intervene and treat the patient before it may be too late. This beneficial aspect of using telemedicine was also proved to be true in the literature such as in the review by Hersh et al. (2001) who closely looked at 8 studies that examined the medical effectiveness of telemedicine. He noted that cardiology patients particularly benefit from using telemedicine in relation to providing a comprehensive patient history and gaining a physical examination. Aspects of the physical examination that improved included blood pressure, which was used with the patients in this thesis. Therefore, in addition to providing for an efficient way of delivering healthcare, providers can in fact improve patients' health by constantly monitoring with telemedicine.

In addition to cardiology-related issues, the majority of the patients who use this telehomecare device also suffer from diabetes, another chronic disease that requires frequent monitoring. According to Schwarz (2000), it is imperative for diabetic patients to regularly document their glucose levels and for physicians to monitor them. In his study, he described a new handheld device called *Glucotel*, which allows patients to

efficiently measure their own blood glucose levels and electronically transmit the information to their providers via a mobile phone. All of this information would be stored in a database while regularly giving the physician updates about any irregularities in the patient's status and thus help the patient maintain better health (Schwarz 2010). Although the telehomecare devices that the patients in my study used did not have this particular feature, the concept of self-measuring one's own health and transferring this information electronically was used with the device the patients had in their home. As the subjects in the interviews expressed, facilities using telemedicine are continuing to develop their equipment so that patients with a wide variety of conditions, including diabetes, can use them.

b.) Weaknesses

(i) Technology Incompatibility

Even though the providers all reported strong satisfaction with the use of telemedicine with their patients, each still felt that there was room for improvement. The most common concern seemed to be with the connectivity of the technology to the actual database in which the information would be transferred. According to the subjects, the technology needs to become more compatible with the patients' home and their connection capabilities. For example, a major issue with those monitoring the patients was that it requires a plain old telephone service (POTS), which some patients do not even have in their own homes. This is because more people are exclusively using cellular phones, as it is cheaper and easier to use.

Also, the home-care physician noted that in order for videoconferencing and other types of technology to work with maximum effectiveness, an adequate broadband connection is needed. This would require either a 3G or 4G data network that is compatible with the laptop or tablet computers that the healthcare providers are using to videoconference. In fact, the provider who used telemedicine for educational purposes reported often having a “fuzzy image” on the instructional slides along with the audio feed not being as sharp as preferred. Telemedicine, today, requires a wide range of technology ranging from the simple landline to advanced networks. Therefore, to be as effective as possible, equipment such as this telehomecare device needs to be designed so that it is easy to use by providers who are basing their clinical judgment on what they see on the screen.

Technological difficulties were also found in studies in the literature, including one done by Lowitt et al. (1998). The dermatologists in this study reported problems with the connectivity in the visual transmission between the physician and patient. They claimed the images were not as clear as they had wanted, and they were unable to view the entire patient with the electronic dermatoscope. When the dermatologists focused into a particular area, they complained that they were unable to precisely diagnose the condition due to their inability to reproduce the image as clearly (Lowitt et al. 1998).

(ii) Patient Compatibility

There also seemed to be a strong consistency in response to the question of what things the providers would change about the use of the telemedicine if they could. Interestingly, two of the three providers responded to this similarly by expressing that

they wished telemedicine could apply to a broader range of patients. However, this is still a challenge since some chronic conditions are so complicated that a simple monitoring of basic signs will not be adequate to assess a patient's health. Rather, more technology needs to be developed and more research studies need to be done showing the effectiveness of any new type of telemedicine implemented. According to the speculation of the homecare physician, this kind of technology is going to continue to grow and will make its way into almost every healthcare facility. Therefore, the technology used needs to be able to accurately diagnose and monitor patients of various conditions and of all ages. Essentially, "telehealthcare will have to become as easy to use as a simple television set was a few decades ago (Subject 1: Interview)." The subject who received the information from the telehomecare device also expressed that the monitor should be used on every kind of patient, such as cancer patients since they are also a large patient population that requires constant monitoring.

4.) Conclusion

In response to the incompatibilities associated with the technology of telemedicine, providers of this service are working to overcome these challenges. For example, the facility that receives the medical information from the telehomecare devices are installing special pagers called GPRS, which can provide the same necessary connection but without the landline. According to the subject, these pagers will "bounce" the signals off the cell phone towers, which will then be received directly to the facility. Since more patients are disconnecting their landlines, those that are using this device are

aware that more of these pagers will need to be purchased to accommodate the patient's current situation.

The interviews showed that telemedicine has various strengths and weaknesses but is overall well received by the patients and providers who use them. Many of the general issues that were addressed by the subjects were consistent with the literature, especially those related to its medical and cost effectiveness, convenience, efficiency and compatibility. With telemedicine, providers are shifting away from the idea of visiting the doctor but are rather trying to bring the same kind of care to the patient's living room. Although all the patients agree that this is making medicine less personable, they also agree that being homebound has given them no better option. However, more research needs to be done to identify and overcome the limitations of telemedicine and allow for its widespread use.

Chapter 4: Conclusions

The growth of modern technology has and is continually changing the way medicine is practiced around the nation. Telemedicine allows physicians to connect with their patients in ways that may not be otherwise possible by using different types of technology. This new area of medicine gives patients the opportunity to access diagnostic care and other useful information that helps them take better control of their health (Darkins and Cary 2000).

The purpose of this thesis was to take a closer look at patient and provider satisfaction with the use of basic telemedicine, specifically a unit that transmits medical readings that each patient takes of him/herself. From the interviews, I was able to conclude that telemedicine has several strengths and weaknesses in serving the needs of both the patients and providers. I found that all the patients were strongly satisfied with their use of telemedicine mainly because it was convenient for them to use rather than visiting the hospital or having a provider come to them. Nonetheless, there were certain mechanical aspects of the technology that frustrated the patients such as its ability to connect and accommodate each patient's individual needs.

I was able to gain further insight into the satisfaction with the use of telemedicine by interviewing providers who use it in their medical practice. The providers also showed strong satisfaction with the use of telemedicine since it allowed them to track the progress of their patients' status without having to actually visit them. In addition, this significantly cut time and the costs that would have been required to see the patients. As with the patients, the providers also identified a couple weaknesses associated with telemedicine including its technological effectiveness such as image clarity. In addition,

all of the providers expressed the importance for the application of telemedicine to a broader patient population.

These findings are significant since they not only confirmed existing literature on patient and provider satisfaction with the use of telemedicine, but did so with specific types of technology that may be new to the field. For example, the medical unit that these patients had in their homes to self-measure their blood pressure, heart rate, pulse oximetry and weight is something that was not used in any of the literature studied in this thesis. In addition, telemedicine used for educational purposes, as one of the providers interviewed in my thesis associates with, was not observed in the literature. Therefore, my thesis added a new perspective to the study of telemedicine by introducing new applications of it and identifying how well patients and providers are receiving it.

There are several important implications of my thesis in relation to the effectiveness of telemedicine and whether it should be accepted by the medical society. One of the largest challenges of telemedicine being used in hospitals nationwide is that insurance companies and the government refuse to cover its costs. This is because owners of these companies are not yet convinced nor believe that telemedicine would be cost effective in treating its patients (Darkins and Cary 2000). From my research and my review of the available literature on telemedicine, I believe this notion is incorrect and that telemedicine would in fact be cost effective and should be covered by insurance companies. Initially, it will be expensive to install and train the employees of how to use the new technology but in the long run, high costs to provide medical care will be saved. As was also found in the literature, all providers interviewed in my thesis expressed that telemedicine is both cost effective and has the potential of improving a patient's health.

These providers studied are not only highly trained physicians but include other healthcare providers including nurses and social workers, each adding a unique perspective to the effectiveness of telemedicine than others.

Another important implication is that telemedicine does in fact decrease the level of personalization between the provider and patient. However, after interviewing the subjects and reviewing the literature, I found that the benefits of providing care and monitoring the health of patients who otherwise do not have access definitely outweighs losing the ability to physically be with the provider. This is because most patients would rather still have some kind of idea about how their health is on a regular or weekly basis rather than live unknowingly of their health until the next time they can make an appointment. These appointments can still be made but the convenience and peace of mind of knowing one's health in between these appointments, especially for severely debilitated patients such as the ones interviewed, is very valuable.

Although my general findings did agree with the literature, there were several limitations to the study. First, the sample size was very small, as I had only interviewed three patients and three providers about their perceptions of telemedicine. The reason for this was that it was difficult to find subjects who had enough experience with telemedicine to be able to accurately assess what they thought about it. Therefore, the small sample size questions the validity of the results. One way I could have secured more interviews would be to snowball-sample more subjects by asking the providers I interviewed if they knew of any others that are using telemedicine with their patients. By contacting these referred providers, I would ask to interview their patients thereby getting the perspectives of both sides. Another way could simply be by doing research on the

Internet to find others around the country that are using telemedicine and request a phone interview. Given this, my thesis was a qualitative study rather than quantitative since even with the few number of interviews, I was still able to gather valuable insight into patient and provider satisfaction with telemedicine. Another limitation that decreases the validity of my study is the fact that this study was a cross-sectional analysis observing these subjects' impressions of telemedicine at one point in time. Therefore, I did not have insight as to whether the views of these subjects had changed. In order to improve this, I would have conducted a longitudinal study in which I would repeatedly measure the same levels of satisfaction of the subjects over time and note any changes that would occur. The third limitation with my study was that the patients who I interviewed had a certain level of bias in their responses to my questions. Since these patients are all homebound, any kind of intervention that will help them avoid having to travel to obtain care will be appealing to them. Therefore, when asked about their level of satisfaction with the medical device they use to transmit vital signs directly to their providers, chances are very good they will respond positively. Finally, another limitation with the study is that all three patients who were interviewed were debilitated due to a chronic condition. This physical state may have affected their cognitive skills and ability to answer the interview questions as thoroughly as they could have. In fact, patient 3 was so debilitated that her husband had to actually answer the interview questions for her.

Despite these limitations, my study gathered information about the strengths and weaknesses of various uses of telemedicine in the care of patients. Since telemedicine is still relatively new and is constantly evolving, more research needs to be done in order to definitively state how effective and efficient it is. Based on my findings, I believe we

need more research with patients with other conditions rather than common chronic conditions such as those who were interviewed in my study. Similarly, approaches investigating how the technology used in telemedicine can be tailored to apply to patients of varying conditions would also be helpful. This study served as a small-scaled preview of how telemedicine is being used and received locally by patients and providers. It also served as an indicator that more knowledge needs to be gained about the effectiveness and efficiency of telemedicine in order for it to be accepted by other providers and patients as a feasible approach to healthcare.

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Appendices

Appendix 1:Subject Interviews

Questions asked to Patients:

*I will write down the questions and scale for the first part of the interview with patients; however, I will read these to them while they look at the sheet.

Satisfaction Rating

Please rate your response to the following statements on a scale of 1-5 with 1 being you “strongly disagree” and 5 being you “strongly agree”

- 1.) I am satisfied with the overall use of telemedicine in my care.
- 2.) Interacting with my practitioner through this unit was as personal as talking to them in person.
- 3.) Using this technology was more convenient than seeing the practitioner in the office.
- 4.) I would rather use this technology frequently with my practitioner than visit the doctor's office fewer times.
- 5.) This technology improves my ability to remain healthy and avoid hospitalization.

In-Depth Interview

- 1.) What is the best part of using telemedicine?
- 2.) What things would you change about the use of telemedicine in the delivery of your care, if any?

Questions asked to Physicians:

Satisfaction Rating

Please rate your response to the following statements on a scale of 1-5 with 1 being you “strongly disagree” and 5 being you “strongly agree”

- 1.) The overall use of telemedicine with your patients.
- 2.) The level of convenience telemedicine helped provide you in scheduling your patients and making time to see all of them.

- 3.) The level of efficiency in using telemedicine in the delivery of your patients' care.
- 4.) The level of quality of the technology used (i.e. videoconferencing, electronic stethoscope etc.).
- 5.) The level at which confidentiality could still be maintained with the use of telemedicine.

In-Depth Interview

- 1.) What aspects of telemedicine makes it beneficial for you to use it rather than traditional care?
- 2.) Did you experience any technological difficulties and if so, what?
- 3.) Are you willing to continue with the use of telemedicine? Please explain.
- 4.) What things would you change about the use of telemedicine in the delivery of your patients' care if any? Please explain.
- 5.) What is a fair payment for a telemedicine visit?
- 6.) Would telemedicine visits be disruptive to your office routine? Please explain.
- 7.) Do you think telemedicine would be a useful tool to reduce rehospitalization? Please explain.

Appendix 2: Consent Form

Consent Form

My name is **Rohit Dhingra** and I am a student at **Union College**. **I am inviting you to participate in a research study that I am conducting as part of my senior thesis project in Sociology at Union College under the direction of Professor Melinda Goldner**. Involvement in the study is voluntary, so you may choose to participate or not. A description of the study is written below.

I am interested in learning more about **physician and patient satisfaction with telemedicine**. **You will be asked to answer a series of questions related to how satisfied you are with the use of telemedicine in the delivery of healthcare**. This will take approximately **10 minutes**. **There are no risks to you of participating in this study. All information will be kept confidential. I will refer to you as a “participant” or “provider,” rather than your name**. You may skip any questions that make you feel uncomfortable. If you no longer wish to continue, you have the right to stop participating at any time without penalty.

Now and during the debriefing session after, I will have the opportunity to ask questions.

All of my questions have been answered and I wish to participate in this research study.

Signature of participant

Date

Print name of participant

Name of investigator

Date