Considerations of Telemedicine in the Delivery of Modern Healthcare

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Telecommunication technologies have made telemedicine a modern health delivery system. Telemedicine enhances home telehealth services as specialty care, patient consultations, remote patient monitoring, and medical education without the patients having to leave their homes. Urban medical centers have used telemedicine to expand access to specialist services by centralizing health care providers to assist patients seen by their primary care providers. This paper provides a brief history of telemedicine; explains how telemedicine works; covers a few cases of telemedicine implementation, identifies lessons learned, discusses some current issues of telemedicine, and concludes with some limitations of telemedicine.

INTRODUCTION

Technological innovations have been the impetus for the development of telemedicine programs. Telemedicine started as a way to provide medical services to patients living in rural areas. It has since grown into such medical interventions as treating soldiers on the battlefield as well as programs at urban medical centers which makes medical services available to underserved populations. Telemedicine programs allow physicians that are off-site to have a platform to see patients at rural and remote locations. Most of the telemedicine programs developed in remote areas are built on the concept that these programs provide patient access to specialty services and to quality of care that would not otherwise be available (Hage, Roo, van Offenbeek, & Boonstra, 2013).

There are both benefits and disadvantages to the care that is provided through telemedicine. The benefits of telemedicine include providing access to specialty care services in underserved areas, a more efficient use of medical resources, and a way to reach patients living outside a hospital's normal service area. However, implementation of telemedicine services requires a number of new protocols and safety measures designed to protect the privacy and confidentiality of patients, as well as to ensure physicians having and maintaining appropriate licensure across state borders, and to allow patients and caregivers to receive adequate training on how to use the technology. Furthermore, providing medical care to patients using telemedicine technologies brings about important medical, ethical, and legal issues that must be addressed.

Examples of telemedicine range from teleconsultations to telesurgery which have made diagnostic medicine and specialized care available to patients located in remote areas. These telecommunication technologies are changing the traditional doctor-patient relationship. Telecommunication technologies have made cost-effective treatment options available by reducing traveling expenses for patients, decreasing hospital readmission rates, and maximizing the number of patient consults a physician can make (Brown, Buettner, & Canyon, 2012).

HOW TELEMEICINE WORKS

Telemedicine is the use of telecommunication technologies and information sharing devices to deliver and support medical care when the patient and provider are separated by a distance. Distance can be understood in terms of geography, socioeconomic status as well as time constraints (Haluza & Jungwirth, 2014; Wicks, Stamford, Grootenhuis, Haverman, & Ahmed, 2014). Telemedicine is also understood based on the information that is being transmitted such as radiographs or clinical data, as well as, how it is being transmitted. For example, what technologies and clinical applications are used? Now more than ever, there is a ubiquitous supply of digital bandwidth. With the ability to compress high resolution video conferencing and high resolution images, the transmission of video, images and data over long distances has been made possible. The decreasing costs of hardware, software, and data transmission make setting up telemedicine equipment and networks more economical feasible, even for smaller medical clinics and offices (Ewing, 2013).

Although video consultations have become the mainstay when one thinks of telemedicine, another important category of technology utilized is referred to as "store and forward" technologies. These include static images, data, and audio clips that are transmitted from remote locations to a database for later review by a medical provider. The advantage of the "store and forward" telemedicine is that both the provider and patient do not have to be available for consultation at the same time. Dermatology, radiology, and pathology are examples of medical services that have utilized "store and forward" telemedicine technologies.

Services offered through telemedicine range from home care and psychiatry to radiology and neurology. Home care, or telehealth, programs that manage chronic diseases such as diabetes, chronic obstructive pulmonary disease, hypertension, etc. utilize devices that monitor and transmit patient symptoms and vital signs. Radiologists and pathologists, for example, utilize image transfers, while clinical specialists such as dermatologists can capture and remotely display their findings such as high resolution images of skin conditions. Cardiologists can receive transmitted electrocardiograms (ECG) and psychiatrists can have interactive consultations with patients via video-teleconferencing (Baig, Gholamhosseini, & Connolly, 2013; Chen & Huang, 2013).

A BRIEF HISTORY OF TELEMEDICINE

First use of telemedicine was in 1877 when a group of 21 medical doctors in surrounding areas made a communication network by means of the telephone with a local drug store. In 1927, a live video consult occurred between a patient and a physician, known as the "radio doctor". Then, in the 1950s, a two-way television group therapy occurred through videotaped recordings and satellite communication in Alaska. Many of the systems developed to deliver healthcare services to remote Alaskan villages served as a model for other rural telemedicine programs. The guidelines of this program were established by the Indian Health Services. Village doctors were located in large towns hundreds of miles away and certified health aides would travel out into remote villages in order to evaluate and treat patients. The health aide would stay in open communication with the village doctor on the patient's condition using radio transmissions.

In 1959, Wittson and colleagues used two-way interactive television for telepsychiatry consultations between the Nebraska Psychiatric Institution in Omaha and the state mental hospital, which was 112 miles away. Also, in 1959, teleradiology was first utilized by sending teleflouroscopic images in Montreal, Quebec via coaxial cable. In the 1970s NASA created a program called the Space Technology Applied to Rural Papago Advanced Health Care (STARPAHC) in Arizona to deliver medical care on the Papago Indian Reservation. The Indian Health Services hospital on the Papago reservation communicated using two-way radio, audio and data communications to a remote clinic in Santa Rosa 50 kilometers away, which was manned by a physician assistant. The network also connected to a referral center in an Indian Health Service hospital in Phoenix which offered access to medical specialists.

Unfortunately, the lack of suitable technologies, the high cost of running these programs, the absence of physician interest, and limited insurance reimbursement inhibited widespread acceptance of telemedicine during the 1960s and 1970s. It was not until the 1980s that there was a renewed interest in telemedicine due to the development of advanced applications for battlefield medicine and disaster relief aid. Initially, telemedicine had been developed to provide medical care for those living in remote and rural areas. However, telemedicine programs eventually grew to include hospital services to military personnel in the battlefield and then expanded to offer highly specialized medical care to urban areas.

The use of telemedicine technologies on the battlefield continues today including the care of soldiers in combat and the treatment of veterans recovering from war injuries. Technologies utilized include video-teleconferencing (VTC), Internet-based email, and "store and forward" data transmission. In Iraq, there was a telesurgery initiative launched in 2008 by Telemedicine Advanced Technical Research Center (TATRC) and U.S. Army Medical Research & Material Command (USAMRMC) where a cardiothoracic surgeon was able to perform a complex surgery with the aid of a surgical specialist located in Texas. This specialist was able to view the operation through live video feed and images could also be frozen, annotated, and then sent back to the deployed surgeon in Iraq. The usefulness of this program extended beyond just military use but to disaster relief as well. Thus, if a disaster such as a hurricane hits land in a rural area, smaller civilian hospitals may not have the needed surgical expertise to deal with the types of patients and injuries. This type of telesurgery program would allow these civilian hospitals access to specialists who could assist the local surgeons in dealing with complex surgical cases.

CASES OF SUCCESSFUL TELEMEDICINE IMPLEMENTATIONS

The Department of Defense (DOD) and the Department of Veterans Affairs' (VA) Veterans Health Administration (VHA) use telemedicine technologies to allow physicians and medical providers to provide medical care, support, and education to traumatic brain injury (TBI) patients both on the battlefield and domestically. The frequency of TBI within the military is particularly high with majority being injured in Iraq and Afghanistan under Operation Enduring Freedom and Operation Iraqi Freedom. A lot of efforts have been made within the military and the VA to expedite the diagnosis and treatment of soldiers and veterans with TBI in order to prevent further deterioration of reaction time, memory, and mood. Researchers at the Defense and Veterans Brain Injury Center (DVBIC) have developed and implemented a remote cognitive assessment system to do emergency cares. Prompt diagnosis and treatment of TBI by offsite physicians would simply be impossible without the aid of telemedicine technologies (Girard, 2007).

The DOD and VHA use interactive VTC as well as web-based "store and forward" technologies allowing them to be able to reach patients who would otherwise be isolated geographically, economically, or due to a disability. Similarly, the VHA's home telehealth programs not only have helped TBI patients but have allowed veteran patients with chronic medical conditions who otherwise would have been admitted to long-term care facilities, to be treated in the comfort of their own homes. This telehealth program has reduced patients' emergency room visits, hospitalizations, and the length of hospital stays. It has further improved their quality of life. The VHA, as well as DOD military bases, have used telemedicine technologies in innovative ways to treat TBI through neurological assessment, mental health services, behavioral health, physical and occupational therapy. The VA and DOD not only partner with each other but with providers in local communities to meet the needs of soldiers and veterans. Clinical interventions using telemedicine will continue to be an important part of the overall medical care offered to combat veterans suffering from TBI (Girard, 2007; Wicks, et al., 2014).

Research has shown that avoidable hospitalizations from ambulatory care-sensitive conditions (ACSCs) can be prevented by providing patients with access at home to medical care providers in a timely manner. With the accessibility of telemedicine, the Department of Veterans Affairs has changed its focus from a hospital-based system of care to a patient-centered and ambulatory-based care. The national VA Care Coordination Home Telehealth (CCHT) is a program that was created to provide a mechanism

for patients to have access to home ambulatory care services for their chronic diseases, such as diabetes mellitus (DM) (Jia, Chuang, Wu, Wang, & Chumbler, 2009).

Telehealth, as previously described, is a form of telemedicine that gives patients access to health care providers from their home using telecommunications and information technology. It allows patients to receive information, education and medical services while remaining in their homes. The CCHT program utilized nurse practitioners and registered nurses to monitor patient's chronic diseases using data received from a telehealth device. This device, using a landline telephone, daily asks patients scripted questions about symptoms and health status. The care coordinators then take actions to follow-up with these patients to make referrals, order new medications, and educate patients about how to take their medications. The CCHT program also reminds them of their clinic appointments and assists them with technical difficulties. A study by Jia, et al. (2009) indicate the long-term effects of this CCHT program on preventing hospitalizations in diabetic patients at four different VA medical centers. Three hundred eighty-seven patients were followed for four years. The results of their study showed that enrollees to the CCHT program were significantly less likely to be admitted for an avoidable hospitalization during the initial 18 months (Jia, et al., 2009).

A study conducted in Northern Ontario, Canada looked at whether a telehealth chronic disease self-management program (CDSMP) improved not only the overall health of patients with chronic diseases but also self-efficacy and healthy behaviors. The goal was to increase access for individuals living in rural and remote communities. Two hundred and thirty patients with chronic diseases such as lung disease, heart disease, stroke, and arthritis participated in the study for one year from 2007 to 2008. The weekly telehealth sessions focused primarily on developing self-management skills. Comparing baseline to four month follow-up surveys, there were statistically significant improvements in self-efficacy, cognitive symptom management, communications with physicians, role function, psychological well-being, energy, health distress, and self-rated health (Jaglal, Haroun, Salbach, Hawker, Voth, & Lou, 2013).

Chronic obstructive pulmonary disease (COPD) is a debilitating disease and exacerbations of the disease most often result in patients having to seek emergency medical care such as emergency room visits. The number of patients worldwide affected by COPD is estimated to be around 64 million people. A study in Denmark conducted in 2008 with 57 COPD patients participating in the Home Telehealth, Chronic Patients and the Integrated Healthcare System (TELEKAT project) for four months. Patients used a wireless telehealth monitoring device to transmit their blood pressure, heart rate, weight, oxygen saturation, and lung function to a web-based portal or their electronic medical record. Results of the study showed that telemonitoring patients had a significant decrease in the number of antibiotics and steroids used, as well as a decrease in the number of clinical consultations, and significantly more patients having controlled blood pressure.

In 2005, the State Government of Minas Gerais, Brazil, established Telehealth Networks linking five university teaching hospitals with municipal health departments. Using low-cost equipment they were able to transmit electrocardiograms and conduct teleconsultations. The goal was to provide primary healthcare providers in the municipalities, many of them were in remote locations, access to specialists at state university hospitals. Between 2006 and 2011, 782,773 electrocardiograms were performed and 30,883 teleconsultations completed. Ninety-seven percent of medical professionals were satisfied with the system and furthermore 81% of teleconsultations resulted in the avoidance of a referral to a distant location. There were also significant reductions in travel costs and significant savings to the public health system of around 11 million dollars. Barriers to effective implementation of this telehealth program, though, included having to continually train healthcare practitioners due to the high turnover. Also, there was lack of reimbursement resulting in the reliance on health department funding and lastly, there were implementation and maintenance issues early on due to poor Internet connectivity (Hilty, Ferrer, Parish, Johnston, Callahan, & Yellowlees, 2013).

Telemental health care programs have been expanding rapidly over the last ten years. Research has shown telemental health to be effective for both diagnosis and assessment of mental illnesses. It has shown telemental services to be comparable to face-to-face care and complementary. Most importantly, telemental health has increased access to needed care and improved patient outcomes. Tele-mental health

services has shown to be well-accepted by both patients and providers. Telemental health has benefited a variety of conditions such as depression in adults, developmental disabilities in children, and post-traumatic stress disorder in veterans. When determining whether telemental health or face-to-face consultations will work better for the patient, culture, language, and type of mental health disorder must be considered carefully. In conducting a cost-benefit analysis, both the direct costs (i.e., equipment and installations) and indirect costs (i.e., patient travel and time) must be taken into account before assessing the return of investment (ROI). Studies have shown that telemental health has proven to reduce both healthcare costs and patient costs. Break-even analysis of multiple studies, however, showed that in order to be cost-effective, a certain number of consultations must take place per year to justify the capital investment costs of implementing such programs (Hilty, et al., 2013).

Roughly 30% of U.S. adults have high blood pressure and only about half of these patients have their blood pressure (BP) under control. In fact, high BP is the most common reason for patients to go to their primary care doctor. The annual costs associated with high BP are estimated to be greater than 50 billion dollars. A study published in 2013 in Minnesota involved 450 patients with high blood pressure who were randomly assigned to either telemonitoring or usual care for a period of 12 months. The telemonitoring group used a home BP telemonitoring device that stored and transmitted data through a modem to a secure website, which was managed by pharmacists. The pharmacists would consult with the patients via telephone consultation and adjust their antihypertensive medications accordingly. The results of this study showed that the percentage of patients with controlled BP was significantly higher in those patients assigned to BP telemonitoring with pharmacist case management for the 12 months of intervention and for 6 months post intervention, compared to those patients who were assigned to usual care (Margolis, Asche, Bergdall, Dehmer, Groen, & Kadrmas, 2013).

Telemedicine is not only able to reach patients in remote rural areas but it is also able to benefit patients in urban centers. Mercy Health System in Wisconsin and AtlantiCare in New Jersey are examples of urban hospitals that have developed telemedicine programs that offer many different types of services. For example, Mercy Health System implemented a home health project that allows them to remotely treat patients with many different types of chronic conditions in their own home. Mercy Health uses telemedicine technology similar to other programs including a variety of remote monitoring services such as arrhythmia monitory services with electrocardiograms (ECG), PT/INR patient self-testing for patients anti-coagulated on warfarin, and health assessment surveys to manage almost any type of chronic disease. They utilized devices that collect measurements such as weight, blood oxygen saturation (SpO2), blood pressure, heart rate, blood glucose, hemoglobin A1c, lung function using peak flow, body temperature, and Zo (body fluid status). These devices securely transmit data through landlines or cellular networks. Mercy Health's home health program is thus able to manage a number of chronic diseases such as congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), hypertension and diabetes (Chen & Huang, 2013).

These programs are only successful, though, if patients take initiative in the self-management of their chronic diseases. Furthermore, once equipment is installed, extensive patient or caregiver education is required in order to properly use these devices and obtain accurate measurements. Once the data is transmitted daily to the control center in the hospital, a nurse reviews the data for any alerts, notifying the patient's provider for follow-up if these results are not consistent with that patient's usual state of health. The benefits of home health telemedicine, or telehealth, include improved compliance, improved patient and caregiver satisfaction, decreased anxiety, increased quality of life, and patient empowerment through active participation in managing their own diseases. From a healthcare professional perspective, telehealth offers daily monitoring and management, preventative care, early intervention, improved provider-patient communication. Furthermore, it creates efficiencies and cost savings by allowing providers to manage and monitor multiple patients simultaneously, which reduces ER visits and improves allocation of scarce medical resources.

AtlantiCare, on the other hand, uses telecommunication technologies to develop a variety of programs including telepsychiatry and telestroke services. AtlantiCare Regional Medical Center's psychiatry department provides teleconsultation services using VTC technologies between two of their main

campuses, which are 10 miles apart. This program reduces the time and travel expenses of going between two sites not only for the patient but for the providers as well. It is important to rely on these teleconsultation services since there is currently a shortage of psychiatrists. There are limitations with telepsychiatry, especially due to the complexity of mental illness. Thus, teleconsultations have proven to be most useful in the preliminary analysis of patients. The AtlantiCare telestroke network is achieved through use of a robot, which allows patients at smaller outlying hospitals to receive specialty services from a neurologist in a timely manner during the critical period immediately following stroke symptoms. This robot is both wireless and mobile allowing neurologists to be present remotely even if they are physically located in either a central control station or on their laptop installed the necessary teleconsultation software. The robot and the control station utilize broadband, Internet, and wireless technologies to share data. The primary function and use of this technology is triaging patients in the emergency department or inpatient hospital who are presenting with neurological symptoms suggestive of stroke in order to quickly determine the best course of treatment for that particular patient (Frist, 2014; Yang & Silverman, 2014).

LIMITATIONS OF TELEMEDICINE

Notable limitations of telemedicine include lack of funding and reimbursement from insurance companies primarily due to the inability to justify telemedicine based on cost-benefit analysis. For example, one of the main limitations of the two telemedicine programs at Mercy Health system and AtlantiCare was lack of insurance coverage for these services. In fact, the reluctance to cover telemedicine services by Medicare and private insurance companies is the major cause of its slow expansion and utilization. The one exception is teleradiology services, which have been the only telemedicine programs to receive full reimbursement from insurance payers. Limited physician acceptance is another notable limitation (Sun, Wang, Guo, & Peng, 2013).

Historically, there has been an absence of research demonstrating the accuracy and clinical effectiveness of many telemedicine applications. Exceptions have included teleradiology and telepathology, which have adequate supporting evidence and have been implemented successfully for years. With the capital investments that are required to implement many of the complex technologies of telemedicine, the lack of systematic supporting evidence has inhibited its widespread implementation, particularly in rural areas where it is needed most. Further research is needed to determine efficacy, safety, satisfaction, and cost-effectiveness of telemedicine.

Limited physician acceptance is another notable limitation creating provider barriers in implementing telemedicine services such as clinician doubts as to the effectiveness of telemedicine services, viewing the technologies as inconvenient and cumbersome, and lately experiencing lack of reimbursement for these services. Provider buy-in to telemedicine services is essential to its implementation and its success. Despite these barriers, the growing evidence of its effectiveness and the advancement of telemedicine technologies have contributed to its continued expansion and utilization (Brooks, Turvey, & Augusterfer, 2013; Sun, et al., 2013).

Legal Issues

The physician-patient privilege is an important law and is the foundation for the trust needed in a provider-patient relationship. The Health Insurance Portability and Accountability Act (HIPAA) provides laws that protect a patient's right to privacy by creating protected health information or PHI. Responsibility and accountability are essential to ensuring that telemedicine safeguards patient confidentiality and privacy. However, if third parties were able to gain access to protected health information by accessing electronic communications, such as telemedicine, this could potentially damage the confidentiality of provider-patient communications. Ensuring providers are appropriately licensed is another important legal consideration, especially, if the telemedicine programs reach across states lines. There is currently lack of legal precedence regarding both licensure and liability of remote delivery of telemedicine (Jaglal, et al., 2013). Currently, state laws require that if physicians or providers are going to

treat patients in their state they must be licensed in that state. Therefore, unless these laws change, telemedicine programs that are implemented across state lines must ensure that their medical providers are appropriately licensed in both states. One solution to this issue of licensure has been solved at the Department of Veterans Affairs and the Indian Health Service by allowing universal licensure if the provider is licensed in at least one of the 50 states.

Ethical Issues

The first ethical issue that must be considered regarding telemedicine is whether there is adequate respect for persons who are treated via telemedicine. In other words, are patients treated as autonomous agents and are those who have diminished autonomy protected? Proponents say telemedicine does respect persons by providing access to scarce medical resources regardless of their location. However, critics of telemedicine worry that it has the potential to dehumanize patients through use its technology. Obtaining informed consent from the patient is essential to ensuring patients maintain their autonomy and that dehumanization is avoided (Assasi, Schwartz, Tarride, Campbell, & Goeree, 2014).

Beneficence, which includes non-maleficence, is another ethical issue that must be addressed when considering telemedicine. In medical ethics, this principal is related to the maxim, "Primum non nocere," which means, "above all do no harm". On one end, telemedicine increases patient access, reduces costs, allows for better continuity of care, and provides more timely care, which reduces travel expenses and lost work time. It empowers patients to take a more active role in their own healthcare, which in turn improves compliance, patient satisfaction, and anxiety. On the other end, telemedicine has the potential to depersonalize provider-patient interactions by replacing face-face interaction with virtual consultations in order to reduce costs. Furthermore, network disconnections and other technical problems also pose potential patient harm. Safeguards must be put in place to be able to appropriately deal with these situations (Nordgren, 2013).

When telemedicine is viewed as a supplement to traditional face-to-face physician-patient interactions and not as a replacement the benefits become apparent. In fact, telemedicine is believed to be best utilized in situations where a patient cannot see a physician face-to-face due to time, physical, or geographical barriers. Effective patient education, communication, and responsiveness to these limitations and concerns will help to minimize the potential disadvantages.

The last ethical concern of telemedicine is that of justice which requires that all patients be treated fairly and equitably. Justice can refer to the allocation of scarce medical resources in a fair and equitable manner. Many times patients located in rural and underserved areas do not have access to the same qualified medical providers creating uneven distributions of medical care. This is especially true for elderly patients who are faced with a number of barriers to accessing care such as geographical, physical, cognitive, and economical obstacles. Telemedicine can provide access for these patients to qualified medical care in remote areas which will hopefully improve the fair and equitable distribution of scarce medical resources (Assasi, et al., 2014; Hilty, et al., 2013).

There are still many unresolved questions with telemedicine such as what is its true place in our health care system? And, can telemedicine successfully provide quality health care at an affordable cost? Accurately answering these questions depends on a number of factors such as provider and patient expectations, matching technology and equipment to medical needs of patients, economic feasibility, legal, ethical and social issues, and lastly, organizational issues such as appropriate training as well as managerial and administrative support. Other questions include: what training and certification should providers receive in order to deliver telemedicine effectively? And, how much should providers be reimbursed from insurance payers for these services?

CONCLUSION

Telemedicine has the potential to reduce healthcare costs for both hospitals and patients. Research from the Benton Foundation predicts that 850,000 patient transfers between hospital facilities could be avoided by utilizing telemedicine consultations; resulting in a $537 million annual savings. In the cases

previously mentioned, there have been significant annual savings realized through use of telemedicine programs. Telemedicine can improve access, quality, quantity, and continuity of medical care for patients as well as reduce healthcare costs.

Telemedicine also provides a solution to help alleviate the physician shortages in rural areas and the overuse of emergency room visits. Preventative medicine is a key to the future success of the U.S. healthcare system. Telemedicine has the potential to significantly benefit preventative medicine efforts, which will ultimately reduce costs and improve population health. As medicine in the U.S. becomes more patient-centered, versus hospital or physician-centered, telemedicine can offer patient-centered care by providing medical services to patients in the comfort of their own homes.

The first question that should be addressed before implementing a telemedicine program is: what are the current shortages of medical care in a particular area. Secondly, can telemedicine technologies and services (i.e., the transfer of images, live video, and data remotely) be used effectively to deliver such care? Implementing telemedicine without carefully considering whether it can effectively meet these needs will result in wasted use of scarce medical resources and investment capital.

Telemedicine has been shown in a number of studies to be a cost-effective way of providing both primary and specialty care for those who otherwise might not have access to these services. More research, though, is needed in determining if telemedicine is indeed a cost-effective way of delivering diagnostic, therapeutic, as well as case management services on a larger scale. However, as technology continues to advance and more research is conducted showing the benefits of telemedicine and its place in our healthcare system, the more telemedicine will be accepted and expanded. Care must be taken to maximize the benefits of telemedicine and at the same time take measures to ensure proper safeguards are in place to prevent patient harm and maintain patient privacy and confidentiality. Telemedicine must not be viewed as an end in of itself. Instead, it should be viewed as an important tool or method of providing needed medical services to patients and medical consumers, especially, to those patients in remote areas who might otherwise not have access to care.

New technologies used in telemedicine have brought to light the important ethical considerations of telemedicine such as patient autonomy, beneficence, non-maleficence, and justice. The ethical responsibility of medical providers to treat all patients with dignity and respect requires that medical care be provided in the most cost-effective and beneficial way to all patients. Telemedicine offers the opportunity to be able to offer high quality medical care to patients in both rural and urban locations. The legal implications of telemedicine must also be addressed such as creating safeguards and laws that will protect patient rights of privacy and confidentiality. Furthermore, the laws that govern the proper licensure of medical providers must be revised to allow easier implementation of telemedicine across state lines yet they must also ensure that these providers have the proper education, training and credentials.

Political factors such as being able to deliver low-cost health care to all patients will continue to be an important driver in the advancement of telemedicine programs with the aim of reducing costs, improving quality, and increasing access to health care. The integration of telemedicine technologies with such platforms as electronic medical records and expanding insurance reimbursements telemedicine care will be essential for the continued success of telemedicine programs of the future. It is important, though, that standards and protocols be established in regards to telemedicine communication technologies so that the largest number of rural and hospital medical centers will have compatible communications.

Telemedicine services can give providers a competitive advantage by allowing them to expand their practices into rural areas with limited economic risks and be able to provide specialty services where full-time staff would normally be impossible to serve.

With the increased size of aging U.S. population, telemedicine offers the ability for patients to receive quality health care services and at the same time reduce costs. The treatment of chronic illnesses most often starts in a hospital setting and follow-up care services must continue for the patient at home. Telemedicine allows for these services to continue through outpatient telehealth. Telemedicine's potential benefits include reduced healthcare costs, increased patient access to providers, improved quality and continuity of care, and faster, more convenient treatments, which reduce patient travel costs and lost work time. Telemedicine should not replace face-to-face consultations of providers and patients. Rather, it

should supplement these important relationships. Telemedicine is best utilized when patients would otherwise not have access to needed primary and specialty care in many remote and rural areas.

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