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## TELEHEALTHCARE: THE IMPACT OF TECHNOLOGY IN MEDICINE

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### Abstract

Telehealthcare is the delivery of traditional healthcare services via any means of telecommunication. Over the past forty years, telehealthcare has become increasingly relevant to the practice of medicine. The ability of a medical practitioner to conduct medical examinations remotely has greatly increased access to care in rural areas. Electronic storage and transmission of electronic healthcare records (EHR) is transforming how healthcare practitioners conduct business. As telecommunications technology has advanced, so has telehealthcare (Friedman, Parrish & Ross, 2013). With the advent of the internet, telehealthcare has become a much larger part of the future of medicine.

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### 1. Introduction

Since the early 1800s and the advent of the commercial telegraph, telecommunications has changed dramatically. Prior to the telegraph, the most convenient and quick way to transmit messages and communicate over long distances was to send a letter, which could take a week to several months depending on its intended destination. The telegraph turned communication into a real time event. People could now communicate across oceans and continents at lightning speed. The next major telecommunications breakthrough was the telephone. In the late 1800s and early 1900s the telephone superseded the telegraph as the primary means of real time communication. The telephone allowed users to communicate directly with no need to have advanced operational knowledge previously required by the telegraph (Morse code). The next to come to the telecommunications world was video teleconference. While this technology was never widespread outside of corporate board and meeting rooms, it was the first real step towards modern telehealthcare. This technology allows users to be connected visually and by audio on both ends of the teleconference. This ability to communicate face-to-face, virtually, allows for interaction similar to in-person meetings. Then came the internet, spawning e-mail, allowing written messages, similar to letters, to be transmitted between users in real time ("Internet history from," 2007). This quick, passive form of communication changed the way the world conducts business and interacts ("Internet history from," 2007). Another development that came around the same time as e-mail was the mobile telephone. This device allows users to be perpetually connected to

others not in the same location. The newest development in telecommunications, video chat. This advanced form of teleconference is the basis for the patient-doctor visit in the telehealthcare model. Video chat allows users to connect with any other user around the world and communicate in a combination of audio and visual media, similar to a face-to-face discussion. Whether conducted over standalone portals or via mobile devices, video chat extends the reach of the doctor's office to the entire world. Finally, the internet has brought about cloud-based software and data storage systems, which are an absolute necessity for a successful telehealthcare delivery system. These systems allow doctors, other healthcare providers, and patients to adopt telehealthcare via any web access point rather than utilizing new hardware or software at their location.

## 2. Technology and Healthcare

Medicine, and healthcare for that matter, is an art as old as time itself. In every culture across the globe, there has always been one form or another of doctor. While this profession started out as a faith and religious position, as the knowledge base of medicine has increased over time, doctors have been divorced from religion and are now considered scientists (Buckenmaier, 2011). Many modern medical traditions, and regulatory expectations, revolve around the doctor-patient visit. This face-to-face interaction is where the doctor gathers most of the information used to diagnose or analyze a patient's health. The first traditional doctors, as they are now referred to, would be called concierge doctors today, as they made house calls to check on their patients. The town doctor was an integral part of early urban/suburban life (Buckenmaier, 2011). Today when a person is sick, or injured, it is common practice to go and see the doctor to be evaluated. The advances of medicine and medical technology necessitated this change; however, with new technologies and the overhead of office staff and office space, the cost of a doctor visit, and any other medical interaction, has become substantially more expensive over time. As of today, healthcare expenditures represent a full one-sixth of the GDP in the U.S. annually (Wang, 2012). This amount and rapid growth of healthcare spending necessitate change.

One notable recent change to healthcare, in the U.S., is the Patient Protection and Affordable Care Act, colloquially known as "Obamacare". This new healthcare law is aimed at reducing overall healthcare costs and slowing their growth. One of the many ways this law seeks to accomplish this goal is by advocating, and at times, requiring the adoption of some telehealthcare principles. This law is also aiming to transition the current healthcare delivery system from reactive to proactive through the use of accountable care organizations (ACOs), a change that will necessitate and create additional use of telehealthcare systems.

Video chat and video conferencing is changing the way doctors conduct patient interactions in remote, underserved areas, as well as with patients in the hospital. Internet technologies now even allow surgeons to remotely guide robots conducting surgeries on patients in otherwise unreachable locations. This advance creates opportunities for better healthcare in rural areas, battlefield forward positions, and lower income areas world-wide. Allowing patients and doctors to interface from the comfort of their own space can decrease a doctor's time spent per visit, allowing more patients to be served (Friedman, Parrish & Ross, 2013). Video sessions with the doctor may also be recorded for later use by the doctor, patient, or other healthcare practitioners increasing patient safety and reducing repeat visits for the same condition. These recordings will become part of the patient's electronic health record (EHR) ("Telehealth," 2013). Another goal of telehealth is to help with patient management and disease control. Certain home use medical devices, such as oxygen generators, breathing equipment, home dialysis machines, and insulin pumps can now be outfitted with wireless or wired internet connections and automatically upload usage and other data to the patient's EHR and alert patients and doctors when there are issues with usage or the device malfunctions (Friedman, Parrish & Ross, 2013). This data can be invaluable to physicians and allow more patients to receive healthcare in the comfort of their own homes rather than during more expensive hospital stays.

EHR is the largest advancement in medical technology in the 21st century. The possibilities that EHR makes available are so vast that they may outweigh even the video chat patient visit as a new healthcare tool. EHR

reduces errors from the misreading of poor handwriting in patient records, allows patient information to be transmitted, recorded, and utilized in real time, as well as creating an electronic accounting of healthcare transactions and actions that can be data-based (Calman, Hauser, Lurio, Wu & Pichardo, 2012). The ability to catalog and analyze all healthcare interactions and transactions allows for a much better accounting of healthcare expenditures, creating transparency that will lead to reduced costs (Calman, Hauser, Lurio, Wu & Pichardo, 2012). Reducing medical errors has always been a cornerstone of medical practice, EHR brings this to a new level (Caplan, 2007). Poor physician and provider handwriting accounts for more than 7,000 preventable deaths per year in the U.S and untold other errors, making this a very important benefit of EHR implementation (Caplan, 2007). Finally, EHR streamlines the medical accounting, billing, reimbursement, and fraud prevention by conducting all medical transactions and record keeping in the same integrated system. That being said, the largest driver of EHR and integrated healthcare informatics systems in the United States has been the federal government, who is the nation's largest health insurer.

Along with the U.S. government, there are many private companies driving the telehealthcare business. These businesses include doctor's practices, telehealthcare providers, private hospital systems, and commercial insurance companies. As with any other new industry, the telehealthcare industry has experienced successes and failures. Notable successes in telehealthcare include Practice Fusion, a cloud-based, free electronic health record system available for doctors. This system boasts over 75 million patients under the care of over 30,000 physicians ("About practice fusion," 2013). The free software and data storage, as well as the system's ease of use and specialization integration, make this system one of the top telehealthcare systems currently in use ("About practice fusion," 2013). There are many patient-to-physician video conferencing services currently in use, including those used to connect a patient with his or her regular physician, as well as those that provide connections to a physician for urgent care (non-emergent) situations (Francis, 2013). As more and more physicians are trained in an environment where telehealthcare practices and systems are the norm, there will be more physician use of these systems. As this use increases, there will be an increasing drive for integrated, standardized solutions that better the healthcare delivery system, improve patient care, and hold down healthcare costs.

### 3. Benefits of Telehealthcare

Advantages abound for telehealthcare companies, practitioners, and patients; however, telehealthcare also faces some significant disadvantages. Many older physicians, especially those in family practice, have used paper health records for many years and are resistant to change. As many of these doctors are close to retirement, even the monetary incentives and penalties are not enough to encourage adoption of required EHR systems. Another concern surrounding telehealthcare is patient safety during virtual visits (Lustig, 2012). Many opponents of the virtual visit model are concerned that patients may opt for a virtual visit during an emergency situation rather than calling for emergency help or visiting an emergency room. Currently, the government sets standards for EHR systems and virtual visit practices, but these only apply to those providers working with Medicare or Medicaid patients (Francis, 2013; "Telehealth," 2013). As there are no clear standards for the entire industry, more companies have entered the market, trying to generate profit. This has led to a very fragmented system, that encourages innovation, but does not encourage accountability or integration. Lastly, and most notable among concerns with telehealthcare is patient privacy and data security (Francis, 2013). While new telehealthcare delivery systems will provide for better patient safety and a wealth of new healthcare information, there is always the concern that data, especially data transmitted and stored via the internet may be susceptible to security breaches and misuse (Francis, 2013). As a result, many opponents of telehealthcare have significant ammunition.

Most of these concerns affect the healthcare system as a whole, not just telehealthcare. In order to assuage many of the concerns surrounding telehealthcare delivery and information, it is important that the industry become standardized, integrated, and regulated. This upgrade (standardization, integration, and regulation) is best and most easily applied across the entire healthcare system via the establishment of a universal healthcare system, also known

as single payer healthcare (Oliver, 2009). The U.S. is the only established, first-world country that does not offer its citizens universal healthcare (Oliver, 2009). As a result, the healthcare system is driven by profit, focused on treatment rather than prevention, and is unable to cope with a growing population with increasing life expectancy. Establishment of single payer healthcare in the U.S. would simultaneously create an environment that synchronizes, streamlines, and integrates the healthcare system (Wang, 2012). As a part of this integration, telehealthcare delivery systems will surely play a large role.

#### 4. Conclusion

Telehealthcare is a relatively new concept in the medical community. As a result, the industry is still experimenting and experiencing some issues. As the telehealthcare industry evolves to meet the needs of patients, providers, and insurers, many of these systems will develop integrated solutions to issues that are today considered standard in the healthcare industry (Friedman, Parrish & Ross, 2013). The development of the telehealthcare industry, specifically internet-based technologies, has the ability to transform healthcare in the next 10 years, streamlining patient care and creating a system that uses far less resources to provide better care to more patients than ever before (Francis, 2013).

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