

Telehealth

Changing Healthcare for Humans and Animals

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INTRODUCTION

Telehealth is an innovative and revolutionary method of healthcare delivery that provides high quality, convenient, accessible healthcare at a lower cost. The broad umbrella of telehealth is a broad category that includes telemedicine and mHealth and addresses the growing physician shortage while increasing patient engagement through telecommunications technology. Telehealth provides some interesting and potentially very positive solutions to the care of infants, small children, and animals,

who cannot necessarily speak for themselves. Although telehealth/telemedicine raises some serious practical, legal, and ethical challenges, many health care providers are committed to not only improving access to high quality medical care, but to innovation as well.

THE TELEHEALTH UMBRELLA

The telehealth umbrella includes both clinical and nonclinical services, consulting, education, and information through telecommunications devices such as smart phones, tablets, wearables, laptops, et cetera. Telehealth is a broad category and includes telemedicine, which focuses mainly on clinical services delivered at a distance via two-way video, e-mail, smartphone apps, wireless tools, and other telecommunications technology (Raskas, Gail, Schinasi, & Vyas, 2017). In addition to telemedicine, eHealth and mHealth also fall under the telehealth umbrella.

DEFINITIONS AND DISTINCTIONS

According to the Health Resources and Services Administration of the United States Department of Health Human Services, Telehealth is defined as

the use of electronic information and telecommunications technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health and health administration. Technologies



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include videoconferencing, the internet, store-and-forward imaging, streaming media, and terrestrial and wireless communication. ("Telehealth Programs," 2015, para. 2)

The American Telemedicine Association defines telemedicine as "the remote delivery of health care services and clinical information using telecommunications technology. This includes a wide array of clinical services using Internet, wireless, satellite, and telephone media" ("About Telemedicine," n.d.).

The World Health Organization defines eHealth as "the use of information and communication technologies (ICT) for health," and mHealth or mobile health as "the medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices" (World Health Organization, 2011, p. 6). Mobile health includes an exchange of health information via cell phones and tablets, such as appointment reminder messages, reminders to check blood sugar for diabetic patients, and alerts about large-scale outbreaks of disease (Butcher, 2015).

Although the terms telehealth and telemedicine are often used interchangeably, they are distinctly different. Both delivered at a distance using telecommunications technologies, telehealth is broader and includes nonclinical services, while telemedicine focuses on clinical services (Raskas et al., 2017). This article will discuss telehealth/telemedicine, and the benefits and challenges this innovative trend is facing as adoption and use is rising around the world.

HISTORY OF TELEMEDICINE

In 1905, a Dutch physician, Willem Einthoven, performed an early form of telemedicine by transmitting electrocardiogram data from a distance, and in 1924, Hugo Gernsback invented a "fantasy" tele-

medicine tool with robotic fingers and a projected video to remotely examine patients. However, it is Kenneth Byrd who gets the credit for the term "telemedicine." In 1968, Byrd linked Boston Logan Airport with Massachusetts General Hospital, creating the first telemedicine system using two-way, interactive television to remotely diagnose and treat patients from transmitted medical images. In the 1960s, 1970s, and 1980s, the National Aeronautics and Space Association used telemedicine to treat astronauts in outer space, residents of rural Indian reservations in Arizona, and earthquake victims in Armenia. In 1989, with the invention of the World Wide Web, telemedicine's capabilities were greatly expanded, and the early 1990s saw the creation of the American Telemedicine Association and telehealth consultations for rural, underserved population were paid for by Medicare. In 1999, a neurologist provided acute stroke care through "telestroke." The early 2000s saw the emergence of video chat and apps leading to rapid growth of telemedicine in the United States with the use of smartphones and creation of telemedicine companies bringing lower cost, on demand health, and medical care to the masses (Dorsey & Topol, 2016; Iafolla, 2016; Simonson, Smaldiono, & Zvacek, 2015).

MODALITIES, APPLICATIONS, AND DEVICES

Telehealth/telemedicine can be conducted synchronously, such as in live interactive services or asynchronously, as in store-and-forward, where images and other patient data are stored and sent via a secure electronic connection to medical professionals and providers for assessment. For example, in direct-to-consumer telemedicine, patients can connect with their healthcare provider via a secure video or e-mail for consultation right in their own homes. This type of synchronous communication is convenient,

efficient, and cost-effective (Butcher, 2016; Dorsey & Topol, 2016; Simonson et al., 2015). Other methods of telehealth/telemedicine include online communities and consumer networks, wearable sensors and devices, at-home monitoring technology, and mobile health applications (Butcher, 2016).

Telemedicine has four main applications: remote consultation, remote monitoring, remote education, and telementoring. In remote consultation, a healthcare provider, such as a physician, seeks out the advice of another specialist, subspecialist, or other professional colleague to aid in diagnosis or determine a solution to patient issues. For example, Doctors Without Borders has a network of more than 280 experts that use the Internet every day to relay questions and answers about difficult cases physicians encounter in countries around the world, including Niger and South Sudan (Beck, 2016). In remote monitoring, patient vital signs are taken at a distance and transmitted via telecommunications technology. For example, wearable sensors and mobile diagnostic systems such as heart rate monitors, blood pressure monitors, glucometers, and electrocardiograms collect and transmit data to health care providers (Dorsey & Topol, 2016). In remote education, knowledge and education is shared with practicing professionals and providers that are geographically separate from the educators. In telementoring, medical providers and professionals are guided or guide another from a distance using telecommunications. The most common example of telementoring involves robotic surgical tools (Simonson et al., 2015).

Telehealth/telemedicine devices include specialized medical devices and equipment to capture critical patient information. In addition, specific software is available to record, manage, and share that patient data and images. Telehealth/telemedicine devices include examination cameras, medical scopes, camera and illu-

mination systems, stethoscopes, vital signs monitors, electrocardiogram machines, spirometers, holters, retinal cameras, and ultrasound probes. Telemedicine carts or “telepresenters” can be customized and configured with the appropriate medical devices and software technology to fit various applications.

BENEFITS

Telehealth/telemedicine has many benefits including convenience, more timely delivery of high quality healthcare due to reduced wait times, a reduction in health care costs for both the provider and the patient, greater access to care for rural and underserved populations, aids in solving the physician shortage issue, improved doctor-to-doctor consultations, and connection to the healthcare digital ecosystem (LaPlante, 2017).

Telemedicine has been successfully used to treat military personnel, inmates, rural, and underserved populations (Dorsey & Topol, 2016). In the United States, 90% of employees have access to services from telemedicine companies, such as Doctor on Demand, Teladoc, and MDLive (Lin, 2017). The American Telemedicine Association reports that these and other telehealth/telemedicine companies were expected to have over 1.2 million virtual visits in 2016 (Beck, 2016; Lin, 2017).

In 2014, the U.S. Veterans Health Administration conducted more than 2 million telehealth visits for more than 700,00 veterans (Lin, 2017). On April 25, 2017, the “Veteran E-Health and Telemedicine Support Act (VETS)” was introduced in the U.S. House of Representatives. VETS will allow VA health professionals to practice within the scope of their authorized federal duties across state borders. In addition, this act allows an exemption for health professionals to practice across state lines without getting an additional state credential (Bloch, 2017). This is good news. Currently, to provide medical care to a

patient doctors are required to have a valid medical license in the state where the patient is located, forcing virtual-visit companies to work with only locally licensed clinicians. This is problematic for world-class institutions, such as the Mayo Clinic, that treat out-of-state patients. Once a patient has returned home and has a new problem or concern, the doctor's hands or tongue is tied, as he or she can only follow up via e-mail, phone, or web chat and discuss conditions for which the patient was treated for in person unless that physician is also licensed in the patient's residential state (Beck, 2016). In 2016, 17 states joined a compact to honor the licenses of the other states to provide greater access to telemedicine services across state lines (Lin, 2017).

In addition to greater access across state lines, telehealth and telemedicine addresses the current physician shortage and the lack of quality care to rural and underserved populations. In the United States, approximately 20% of the population live in rural areas with a mere 39 primary care physicians available for every 100,000 patients. By the year 2020, the Association of American Medical Colleges estimate an increase in the shortages to 45,000 primary care physicians and 46,000 surgeons and specialists. This shortage results in longer wait times, commutes, and access to consultations for chronic care or for life-threatening diseases (2016 U.S. Telemedicine, 2016; "About Rural," n.d.).

A typical virtual visit costs \$50.00 and lasts 10–20 minutes, in contrast to approximately \$150 office visit fee for the 2 hours spent for a typical 20-minute in person appointment plus drive and wait time (Dorsey & Topol, 2016; Jones Sanborn, 2017; Lin, 2017; Raskas et al., 2017). Many of these virtual visits are conducted from home, which is an advantage for those who have long commutes to see a physician, cannot take the time off work, or are too sick or have another condition that impedes or makes travel difficult. Tele-

health/telemedicine services are convenient, timely, and cost-effective.

POTENTIAL: KIDS AND PETS

Two areas of potential in telemedicine are pediatric care and veterinary care. Neither infants nor animals can clearly use words to describe or explain pain or discomfort. Pediatricians and veterinarians must rely on parents or pet owners to describe behavior, physical symptoms, et cetera. The author interviewed a hospital pediatrician and a veterinarian about the potential for telemedicine in their respective fields.

Urgent care centers could benefit from using telemedicine with a variety of clinical models, such as kiosks for "satellite," "hub and spoke," school-based care, and load balancing. Another use of telemedicine in pediatric urgent care centers are direct-to-consumer platforms where patients can use devices that attach to their smartphones or other standalone tools, such as thermometers, stethoscopes, otoscopes or a combination of these devices to aid in the virtual exam. In addition, telemedicine use for pediatric urgent care centers can facilitate consults with subspecialists, and mentoring (Raskas et al., 2017). For children with acute illness or injury, telemedicine could be used to consult with area hospitals to aid in proper transition, transport, and admissions (Dorsey & Topol, 2016).

Thomas Wojciechowski is a hospital pediatrician with over 20 years' experience, and although telemedicine is not in widespread regular use in his department, he believes it to be a beneficial tool. In fact, he suggested that it be used for consultations with other pediatricians and specialists and to aid in determining the proper level of care for an infant or child patient in the emergency room or an urgent care center. An interesting potential application for pediatricians to provide telemedicine is for schools or athletic tournaments. Schools typically do not have medical personnel on

staff and if they do, it is likely a nurse or a medical assistant and athletic tournaments have trainers, therefore video consultation with a pediatrician could be very beneficial and less costly. During the 2015–2016 school year, Howard County schools in Maryland conducted 150 exams via telemedicine and 87 during the first half of the 2016–2017 school year with 98% of students treated via telemedicine returned to classes right away. This statistic does not include students with contagious or conditions not treatable by telemedicine (Ollove, 2017).

Wojciechowski agrees that telemedicine can be beneficial, but states that caution should be used.

I am in favor of telemedicine for pediatric care, however there is a strong need for caution, in many cases it is necessary to lay hands on a patient for proper diagnosis and although there are advancements with diagnostic tools it isn't the same. This could have serious legal and ethical implications. (T. Wojciechowski, personal communication, April 29, 2017)

Legal and ethical implications are also major barriers to telemedicine in veterinary practice here in the United States and across the pond in the United Kingdom. The Royal College of Veterinary Surgeons in the United Kingdom regulates and guides veterinary practices in the United Kingdom just as the American Veterinary Medical Association regulates and guides veterinary practices in the United States. The Royal College of Veterinary Surgeons follows the United States in recommending the practice of telemedicine unless there is an established veterinarian-client relationship other than just by telephone or electronic communication or an emergency before the animal patient can be seen by a veterinarian (Clark, 2017). The American Veterinary Medical Association Model Veterinary Practice Act states “a Veterinarian-Client Patient Relationship (VCPR) requires the veterinarian to exam-

ine the patient, it cannot be adequately established by telephonic or other electronic means (i.e., via telemedicine) alone” (Ishmael, 2015, para 1). This act specifies establishing new VCPRs, it does not say anything about established VCPRs or teleconsulting (Vogelsang, 2016).

Teleconsulting is a safe and practical application, especially for feline behavioral counseling. Danya Linhean, with over 34 years of combined experience in animal welfare and veterinary science agrees with Wojciechowski that a hands-on exam in which the veterinarian can palpate and manipulate the patient is very important in many cases. The opportunity to observe the feline in the home environment to get a true sense of what the feline is experiencing. When an animal is taken into the animal hospital or clinic, especially felines, there is often a great deal of fear and trauma associated with the visit. Typically, when getting a resting pulse in the clinic, it is not a true measure, as the heart rate is elevated due to the fear factor (D. Linehan, personal communication, April 29, 2017). Linehan suggests educating pet parents on how to take a resting heart rate, blood pressure, and other vital signs to aid in properly assessing behavior. Additionally, the current technologies such as collars that measure heart rate or litter box technology that measures glucose in the urine are not truly accurate and can lead to misinterpreted data. The veterinary profession is about relationships, not apps or technology. Those are just tools to aid in creating a better life for animals (Vogelsang, 2016).

CHALLENGES

Despite the benefits and great potential for telehealth/telemedicine, there are significant challenges and concerns for both human and animal populations. Potential liabilities include standard of care, incorrect diagnosis or prescriptions, fraud, abuse, and legal and ethical issues.

Although many procedures and check-ups can be done digitally, there are concerns about diagnosing humans and animals via phone or video chat without touching the patient, whether it is human or animal. There is a significant concern that telemedicine is not equivalent to in-person care for a variety of reasons. For example, in the case of acute abdomen pain, it is necessary to palpate the abdomen to properly diagnose appendicitis or other conditions. However, in some types of virtual visits, touching may not be necessary. For example, the management of chronic illness, such as diabetes or congestive heart failure. The diabetic patient follows up with his/her endocrinologist every three months and the data from his/her glucometer is sent electronically for review prior to the visit. The heart patient is sent home with a tablet to survey symptoms daily. Both patients benefit from at-home monitoring and virtual visits for maintenance care (Raskas et al., 2017; Zhang, 2016).

Another significant challenge is regulation. Regulation of medical and health care is in the hands of the states, therefore there could be 50 different definitions of “medical practice,” licensing fees, and sets of rules. As of 2015, 41 states have definitions for “telehealth,” 17 states have definitions for “telemedicine,” and two states do not have definitions for either (Butcher, 2015). Most of these definitions do not align with the definitions used by the federal government. More than 200 bills relating to telemedicine were introduced in 42 states in 2016. Most of these bills cover which services will be covered and reimbursement for remote patient monitoring and store-and-forward technologies (Beck, 2016). Only Alaska, Minnesota, and Mississippi reimburse for all three types of telehealth/telemedicine services through Medicaid (Butcher, 2015). As of 2016, 17 states joined the Interstate Medical Licensure Compact that allows physicians providing telehealth/telemedicine services in multiple

states, but the standards of care have not been determined in all 50 states. In fact, only three states—Colorado, Hawaii, and Texas—have standards for telemedicine care (Dorsey & Topol, 2016).

The digital divide is also a challenge for telehealth/telemedicine. Although it is predicted that 90% of people will have smartphones by 2020, not all people, especially those in remote areas, will have access to the Internet or the skills to effectively use the smartphone and apps for telehealth/telemedicine (Dorsey & Topol, 2016). The National Broadband Plan from the Federal Communications Commission is helping to close this gap. Telehealth and telemedicine will continue to grow.

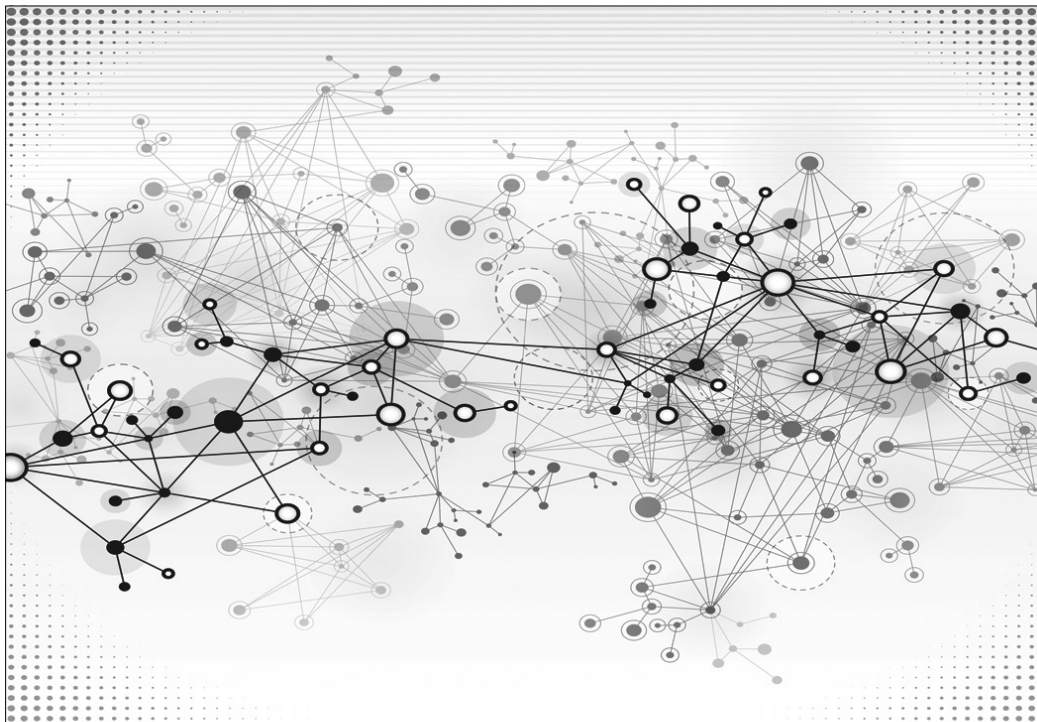
CONCLUSION

Telemedicine is currently a \$17.8 billion industry and is predicted to grow to \$34 billion by the year 2020 (Iafolla, 2016). Telemedicine visits are expected to grow exponentially from the 1.25 million conducted in the United States in 2015. Patients, physicians, healthcare workers, and healthcare organization leaders are embracing telehealth/telemedicine. In a recent survey of healthcare executives believe telemedicine is critical to the future success of their organizations. Also, 86% of patients surveyed in 2014 stated that their telemedicine visits were successful and in 2015, 95% of the 1,700 customers in a CVS in-store telemedicine service pilot study were satisfied (Raskas et al., 2017). For successful telehealth/telemedicine acceptance and implementation, there must be appropriate and consistent guidance between the states and federal government, proper training on technology, and clear communication between health professionals is needed.

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