COMMENTARY

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Telemedicine: Past, present, and future

ABSTRACT

Telemedicine has the potential to transform the future of medicine in both rural and urban settings by improving access to medical care and providing a more affordable way to deliver it. Low reimbursement rates and lack of interstate licensing are the main obstacles limiting its widespread use in the United States. Demand for telemedicine, however, will likely continue to rise, and primary care providers will need to be familiar with the practical and legal considerations in establishing this type of service.

KEY POINTS

An estimated 7 million patients in the United States will use telemedicine services this year alone; demand will continue to rise.

Low reimbursement rates and current lack of interstate licensure laws limit the ability of many health care providers to offer telemedicine services.

The rules and regulations addressing ancillary team members' participation in telemedicine vary from state to state.

Areas of future growth include chronic disease management and "hospital at home" care.

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Telemedicine has been used successfully to improve patient access to medical care while reducing healthcare costs. In 2016, an estimated 61% of US healthcare institutions and 40% to 50% of US hospitals used telemedicine.[1] From 2012 to 2013, the telemedicine market grew by 60%. However, its widespread use has been limited by low reimbursement rates and interstate licensing and practice issues.

In this commentary, we discuss the history of telemedicine, current uses and challenges, and areas of future growth.

DEFINITION AND HISTORY

The World Health Organization defines telemedicine as "the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities."[2]

Modern telemedicine began in the early 1900s in the Netherlands with the transmission of heart rhythms over the telephone,[3] which was followed by transmissions to radio consultation centers in Europe in the 1920s. In the 1940s, radiographic images were transmitted by telephone between cities in Pennsylvania.[4]

Today, telemedicine is used in a variety of specialties including radiology, neurology, and pathology[5] and by organizations in the United States ranging from the National Aeronautics and Space Administration and Kaiser Permanente to the US Department of Veterans Af-

fairs (VA). The VA, in particular, is a leader in telemedicine. In 2012, it reduced mental health hospitalizations by over 40%, heart failure hospitalizations by 25%, and diabetes and chronic obstructive pulmonary disease hospitalizations by about 20% using telemedicine programs.[6] In 2015, it provided about 2.1 million telemedicine consultations to 677,000 veterans.[7]

TYPES OF TELEMEDICINE PROGRAMS

There are 2 types of telemedicine programs.

Synchronous programs take place in real time and are a live 2-way interaction between the patient and healthcare provider. This includes virtual appointments that are conducted using the patient's smartphone, tablet, or computer with a camera. When using a smartphone or tablet, patients must first download an app that connects them with a provider.

Asynchronous programs, also known as "store and forward" applications, are not live and involve the transfer of images, videos, and other clinical information that a healthcare provider views and responds to at a later time. In this case, patients may wear medical devices to monitor and track health information (eg, blood pressure) in a personal health application that they forward to their healthcare provider.

IMPROVING PATIENT ACCESS TO CARE WHILE REDUCING COSTS

Telemedicine allows patients living in both rural and urban areas to access healthcare when they need it. Currently, about 59 million Americans reside in health professional-shortage areas, which are rural and urban areas with shortages of primary care providers.[1] These patients often experience long delays when attempting to schedule a healthcare visit[7] and may experience issues with continuity of care if they are unable to see the same care provider at every visit.

It also provides access to care to patients without reliable transportation or those who may be too sick to travel long distances. For some patients, such as those with cystic fibrosis who do not want to come to the hospital for fear of contracting multiple antibiotic-resistant bacteria, a virtual office visit may be safer.

At the same time, telemedicine helps reduce healthcare costs. For example, it:

- Optimizes staff distribution and healthcare resources within a healthcare facility and across an entire system
- Enables primary care providers to conduct appointments without additional office staff at any time, thereby extending office hours and availability
- Reduces the financial impact of patient no-shows
- Improves patient engagement and outcomes
- Reduces unnecessary office and emergency room visits and hospital admissions.

The last point is especially important for senior living and skilled nursing centers whose residents are known to have high rates of hospital admissions.[8,9] In these facilities, 24-hour medical assistance may not be available, and telemedicine can help troubleshoot common problems.

LOW REIMBURSEMENT RATES CURTAIL USE

Limited reimbursement has curtailed the widespread use of telemedicine. Although rules for reimbursement are evolving, telemedicine still represents a small amount of total healthcare expenditures. In 2015, Medicare spent approximately $14.4 million on services delivered via telemedicine—less than 0.01% of total spending on healthcare services.[1]

About 59 million Americans reside in areas with shortages of primary care providers

Currently, 31 states and the District of Columbia have telemedicine parity laws that mandate private commercial insurers to pay for telemedicine services.[10] Unfortunately, there is a lack of uniformity in the specifics of these laws, resulting in variations in reimbursement rates. Furthermore, a large number of larger insurers such as Medicare and Medicaid and many self-insured plans do not fall under these mandates.

Another factor that affects reimbursement for telemedicine services is the setting of the medical encounter. Medicare reimburses providers for telemedicine services only when they are conducted at specific sites such as physician's offices, hospitals, rural health centers, and skilled nursing facilities. Additionally, Medicare only reimburses for services in

areas with a shortage of healthcare professionals and in non-metropolitan areas, which excludes many urban patients.[11]

In contrast, more commercial reimbursement is occurring for online urgent care, and options for commercial reimbursement of online behavioral services are being explored.

INTERSTATE LICENSURE ISSUES

Current licensure laws also limit the ability of many healthcare providers to offer telemedicine services. Federal law requires providers to be fully licensed to practice medicine in the state where the patient is physically located. In cases of health systems that have locations in more than one state, providers may need to apply for and pay to maintain multiple licenses (current interstate licensing laws vary across states).

Interstate licensure is one way to solve this problem. Thus far, a number of states have joined the Interstate Medical Licensure Compact that intends to allow physicians to obtain expedited licenses to practice in multiple states.[12]

The federal TELE-MED Act was introduced in 2015 but not passed. It proposed to "allow a Medicare provider to provide telemedicine services to a Medicare beneficiary who is in a different state from the one in which the provider is licensed or authorized to provide healthcare services."

Reimbursement and licensure have limited the adoption of telemedicine

CAN TELEMEDICINE FOSTER A GOOD PROVIDER-PATIENT RELATIONSHIP?

In-person encounters provide healthcare providers with the opportunity to build a therapeutic relationship with their patients. Face-to-face encounters also increase patient satisfaction scores and outcomes. As such, critics fear that patient relationships may suffer with the use of telemedicine. However, using video technology for new patient encounters may help overcome this challenge. During a video encounter, the provider can see the patient's facial expressions and take cues from nonverbal behaviors.

At times, the element of distance may enhance the encounter. For example, in behavioral health, patients often feel more comfortable in their home environment than in a sterile office environment.

Telemedicine patients often have positive experiences, given the speed of access, precision, time savings, and the ability to stay in contact with healthcare providers from the comfort of their homes. Ultimately, these virtual visits may help improve compliance with follow-up consultations since the barriers of distance and transportation are circumvented.

WHO CAN CONDUCT TELEMEDICINE VISITS?

Although a patient's healthcare team is likely to consist of members who are not physicians, including nurse practitioners, physician assistants, social workers, and psychologists, not everyone can, by law, conduct telemedicine visits. Currently, the rules and regulations addressing ancillary team members' participation in telemedicine vary from state to state.

TELEMEDICINE VISITS AT CLEVELAND CLINIC

Our health system has several telemedicine programs, including our eHospital program. Launched in 2014, this program provides patients at 4 hospitals with input from staff intensivists and experienced critical care nurses during the night (7 PM to 7 AM) via remote monitoring. These remote caregivers have full access to patient charts and, when signalled, can activate an in-room camera to initiate 2-way audio communication with patients, their families, and bedside caregivers.

In addition, new patient consults are being offered via telemedicine for several services including dermatology, where pictures of skin lesions are reviewed and triaged, and management recommendations are provided accordingly.

In 2016, Cleveland Clinic launched its Remote Hypertension Improvement Program—an enterprise-wide initiative to minimize hypertension-associated mortality and morbidity with the assistance of telehealth services. The program was first piloted in a group of 80 high-risk hypertensive patients who were monitored and followed through a Bluetooth-enabled remote monitoring tool, which exported blood pressure readings to a central dashboard. A multidisciplinary team

of doctors, nurses, and pharmacists used this dashboard to adjust medication when needed and provide virtual lifestyle coaching. Over a 24-week period, the patients' systolic blood pressure decreased by an average of 7.5 mm Hg and diastolic blood pressure by 3.1 mm Hg (unpublished data).

Beginning this year, blood pressure readings will be directly exported from the remote monitoring tool into the patient's electronic medical record, providing the healthcare team with the information needed to make informed decisions to remotely manage patients with hypertension.

Remote monitoring of patients with hypertension is also being used at other institutions such as the VA. In 2016, almost 19,000 veterans were using the remote monitoring system, and this number is expected to increase with the enhanced adaptation of telemedicine services.[13]

FUTURE DIRECTIONS

About 50% of all adults in the United States have at least 1 chronic disease. In all, chronic disease accounts for roughly 75% of the total healthcare expenditure and 70% of all deaths.[7,14] Recent data suggest that virtual chronic disease management represents an untapped market for telemedicine, given its relative underutilization compared to other services such as telebehavorial health and specialty telemedicine. These patients require frequent visits to the doctor, and targeting this patient population with telemedicine may decrease the number of emergency room visits and hospital admissions.

Another growing area in the field of telemedicine is the "hospital at home" model in which patients who meet the criteria for hospitalization but are otherwise stable are treated at home for diseases such as chronic obstructive pulmonary disease, pneumonia, and heart failure. Studies have shown that the hospital-at-home model, when used appropriately, is not only more cost-effective than hospitalization but results in a shorter treatment duration and lower rates of delirium.[15–17]

Finally, in the acute setting, we have seen wide success with telemedicine programs in stroke care, radiology, intensive care, and psychiatry, and several studies have shown mortality rates comparable to those with the traditional model.[18,19] These encounters often require specialized skills and are the focus of multiple ongoing studies.

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