Review Article

A narrative review of telemedicine and its adoption across specialties

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Background and Objective: Telemedicine and video consultation are crucial advancements in healthcare, allowing remote delivery of care. Telemedicine, encompassing various technologies like wearable devices, mobile health, and telemedicine, plays a significant role in managing illnesses and promoting wellness. The corona virus disease 2019 (COVID-19) pandemic accelerated the adoption of telemedicine, ensuring convenient access to medical services while maintaining physical distance. Legislation has supported its integration into clinical practice and addressed compensation issues. However, ensuring clinical appropriateness and sustainability of telemedicine post-expansion has gained attention. We south to identify the most friendly and resistant specialties to telemedicine and to understand areas of interest within those specialties to grasp potential barriers to its use.

Methods: We aimed to identify articles that incorporated telemedicine in any medical or surgical specialty and determine the adoption rate and intent of this new form of care. Additionally, a secondary search within these databases was conducted to analyze the advantages, disadvantages, and implementation of telemedicine in the healthcare system. Non-English articles and those without full text were excluded. The study selection and data collection process involved using search terms such as “medicine”, “surgery”, “specialties”, “telemedicine”, and “telemedicine”.

Key Content and Findings: Telemedicine adoption varies among specialties. The pandemic led to increased usage, with telemedicine consultations comprising 30.1% of all visits, but specialties like mental health, gastroenterology, and endocrinology showed higher rates of adoption compared to optometry, physical therapy, and orthopedic surgery.

Conclusions: The data shows that telemedicine uptake varies by specialty and condition due to the need for physical exams. In-person visits still dominate new patient visits despite increased telemedicine use. Telemedicine cannot fully replace in-person care but has increased visit volume and is secure. The adoption of telemedicine is higher in medical practices than in surgical practices, with neurosurgery and urology leading. Further research is needed to assess telemedicine’s suitability and effectiveness in different specialties and conditions.

Keywords: Telemedicine; digital health; surgical specialties

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Introduction

Telemedicine and, specifically, video consultation are two of the most important advances in the field of healthcare. The term telemedicine is a broad term that encompasses a variety of technologies and services that enable healthcare professionals to provide care from a distance, this includes patient education, remote patient monitoring, video consultation, digital applications, and patient records (1-3). Telemedicine refers to the use of information and communications technologies in medicine and other health professions to manage illnesses and health risks and to promote wellness (4). Telemedicine has a broad scope and includes the use of wearable devices, mobile health, telehealth, health information technology, and telemedicine (4). Telemedicine will be the selected term we employ for reference in the remainder of this review, however our review will focus on virtual visits or consultations.

Modern medicine has seen major advances in technology and research which often go on par with world-altering events. Most recently, the corona virus disease 2019 (COVID-19) pandemic has been a major driving force behind the accelerated adoption of telemedicine technology and its integration into the healthcare system (5). Telemedicine has enabled patients to conveniently access medical services while maintaining a safe physical distance from their providers. In recent years, the utilization of telemedicine has seen an impressive surge, facilitated by new legislation that seeks to simplify its integration into clinical practice and resolve issues related to compensation (6,7). There has been increasing attention focused on the post-expansion phase of telemedicine sustainability, specifically looking at clinical appropriateness (8).

We carried out this narrative review of the literature regarding the use of telemedicine by medical and surgical specialties in the United States, to identify the most friendly and resistant specialties to telemedicine and to understand areas of interest within those specialties to grasp potential barriers to its use. Furthermore, our search and analysis of laws, and policies was limited to the USA. Many factors may cause fluctuations and variability in both physician and patient acceptability of this method, so it's important to understand that the data presented may not apply to all providers or patients. We present this article in accordance with the Narrative Review reporting checklist (available at https://mhealth.amegroups.com/article/view/10.21037/mhealth-23-28/rc).

Methods

Table 1 summarizes our methodology in this article.

Eligibility criteria

A search for full-text articles in four large bibliographic databases, MEDLINE (PubMed), Scopus, Web of Science, and Embase, was conducted for articles where telemedicine was incorporated into the practice of any medical or surgical specialty to determine the rate and intent at which these specialties were adopting this new modality of care. Similarly, a secondary search was conducted within the same databases to analyze the major advantages and disadvantages of telemedicine and its implementation into the healthcare system. For the intent of this article, we focused on telemedicine as teleconsultation. Articles not written in English language and those for which full text was unavailable were excluded.

Study selection and data collection process

Our primary search used the following terms, keywords, or medical subject headings, "medicine", "surgery", "specialties", "Digital Health", and "telemedicine". Firstly, titles were screened for articles of interest. The search engine Google, was also used, and yielded additional articles. Snowballing was also used when able.

Advantages of telemedicine

Cost-efficacy

The cost-efficiency of telemedicine has been proven by past research (9,10). From a patient standpoint, telemedicine provides financial benefits by reducing traveling time, days off work, and expenditures related to emergency room and clinic visits (9). Numerous examples exist. A

Table 1 Research strategy summary

Items	Specification
Date of search	May 04, 2023
Databases and other sources searched	MEDLINE (PubMed), Scopus, Web of Science, and Embase. Snowball of articles were also included
Search terms used	"medicine", "surgery", "specialties", "Digital Health", "telemedicine"
Timeframe	Up to 2023
Exclusion criteria	Articles not written in English language and those for which full text was unavailable were excluded
Selection process	The first author conducted all searches and any doubt in the selection process was evaluated by co-authors 2 and 3

few representative examples are highlighted here. Nord *et al.* showed that through correctly directing patients and avoiding unnecessary emergency room visits, a net savings of $19–$121 per telemedicine session is achievable (11). A 17-year study in California articulated a 2.8 million dollar reduction in travel costs per year using telemedicine services (12). Appropriate triaging through telemedicine platforms may lead to savings predicted to be over $100 million per year in emergency room visits (5). Data from the Texas Department of Clinical Justice's telemedicine system revealed a decline in inmate transportation to outside medical facilities of 85%, which is estimated to produce savings of $780 million in 14 years (13).

Access to healthcare

A survey in rural areas revealed that more than a quarter of adults had difficulty gaining access to healthcare in the past year, mainly due to distance and costs (14). In a separate study by Zhang *et al.* (15), 27% and 23% of patients reported challenges reaching the nearest hospital and their primary care provider (PCP) respectively. Furthermore, the authors reported their telemedicine program called "telestroke" provided a higher chance of prompt life-saving treatments like mechanical thrombectomy or intravenous tissue plasminogen activator promptly, versus the standardized brick-and-mortar care. Additionally, the ECHO (Extension for Community Healthcare Outcomes) program, was established as a telemonitoring program that provides doctors working in remote areas with the opportunity to connect with specialists to obtain advice and consultations on modern healthcare practices (16). Telemedicine may also help increase the reach of other medical programs such as those called complementary medicine, which are holistic in nature and have shown promising results for patient recovery (17).

Disadvantages of telemedicine

Privacy concerns

During the COVID-19 pandemic, legislation permitting the use of video platforms that failed to meet HIPAA (Health Insurance Portability and Accountability Act) standards raised worries that a considerable part of these online communications could be subject to interpretation if intercepted due to the lack of end-to-end encryption (18). Even before the current relaxation of laws, there were worries about HIPAA compliance in multiple telemedicine platforms and their ability to safeguard patient data. Analysts reviewed 600 health applications and found that only 30% had a privacy policy in effect (19). The absence of such a policy can lead to unintentional vulnerability and breach of patient privacy. Additionally, multiple channels for data sharing or transmission have also put makers of these devices under close examination as such gadgets are themselves in danger of compromising patients' protected health information (20).

Economic

In 2014, the American Telemedicine Association discovered that hospitals were unable to bill for most telemedicine services given that most government and private payers would not cover these codes (21). The lack of standardization in both billing and codes, poses a significant challenge for reimbursements of telemedicine

services (22). This was also confirmed by a survey done in the summer of 2020, where 76% of surgeons expressed concern about the issue (23). By 2015, Medicaid had implemented reimbursement for telemedicine services in forty-six states (24). Medicare, however, had established strict rules and criteria that must be met to receive payment (22). This included being in a rural area, such as a Health Professional Shortage Area or a county outside of a Metropolitan Statistical Area (24). Recently, with the opioid crisis in the US, more payor groups have begun to recognize telemedicine as an avenue for quicker crisis intervention (22). For instance, Connecticut used to forbid the prescription of controlled substances via telemedicine, but they have since made an exception given the current opioid epidemic and COVID-19 pandemic (22). In addition, thirty-one states plus the District of Columbia have enacted parity laws that require private insurers to cover telemedicine services (25).

In 2018, Medicaid in several states further reduced barriers to telemedicine services by broadening the scope of what they reimburse (22). California enabled reimbursement for telemedicine services focusing on substance use disorder, while Kentucky eliminated the requirement that a medical professional must be present to get reimbursed for any video consult; furthermore, Colorado extended their reimbursement options to include dental professionals (22). Because of the COVID-19 pandemic, Medicare has provisionally allowed telemedicine services to be provided outside of designated sites and platforms, and Congress has waived the Medicare requirements which limited provision of telehealth care to only underserved rural areas (22,26).

Specialties and their use of telemedicine

The pandemic has promoted a rise in the use of telemedicine, but it is uncertain how the combination of virtual and in-person care has shifted among different patients, clinical disciplines, and illnesses.

In 2021, Patel *et al.* (27) conducted a study analyzing the data of 16.7 million patients from a 6-month period in 2020 including commercial or Medicare Advantage Plans. Their data reported that telemedicine consultation had comprised 30.1% of all visits within this period, with a weekly increase of telemedicine visits from a pre-COVID-19 period to COVID-19 period, 16,540 to 397,977 respectively. Prior to the pandemic, only a small percentage (≤2%) of clinicians in each specialty offered any type of outpatient services via telemedicine, except for mental health professionals such as psychologists (4.4%), psychiatrists (5.5%), and social workers (4.2%). Their data also reported a dramatic increase in telemedicine usage in the pandemic, with over half of clinicians in multiple specialties using it at least once; endocrinology (67.7% of physicians used telemedicine at least once), gastroenterology (57.0%), neurology (56.3%), pain management (50.6%), psychiatry (50.2%), and cardiology (50.0%). However, other specialties saw little use of telemedicine, such as optometrists (3.3% of providers used telemedicine at least once), physical therapists (6.6%), ophthalmologists (9.3%), and orthopedic surgeons (20.7%). The specialties that reported delivering the most total number of visits by telemedicine were, psychiatry being the highest at 56.8%, followed by gastroenterology (54.5%), endocrinology (53.1%), social work (50.8%), psychology (49.1%), and neurology (47.9%).

Within surgical specialties, telemedicine before the COVID-19 pandemic was predominantly used for preoperative and postoperative check-ups (28-31). However, its usage was quite limited (32,33). Once the pandemic hit, telemedicine quickly became a primary method of medical care, hence posing a unique challenge to the surgical specialties, as it had never had to rely on telemedicine to this degree before (34).

In a second study by Chao *et al.* (34), they assessed the use of telemedicine by surgical specialties with the rise of virtual care during the COVID-19 pandemic. Period 1: pre-pandemic, January 5–March 7 2020; Period 2: early pandemic, March 8–June 6 2020; Period 3: late pandemic, June 7–September 5 2020. This study was performed by analyzing claims from a large insurance provider in the state of Michigan. Their reports illustrated the adaptation of surgical specialties to telemedicine. Out of 4,405 active surgeons, 2,588 (58.8%) utilized telemedicine in some way for patient care in 2020. Of those actively seeing new patients, 1,182 (26.8%) used telemedicine. From March 8 to September 5, 2020, there were 109,610 new outpatient visits; 6.1% (6,634) of these were done through telemedicine, while the other 94.0% (102,976) were done in person. This is a stark contrast to 2019, during which only 8 (less than 0.1%) of 173,939 visits were done through telemedicine. From January 5 to September 5, 2020, the mean weekly rate of telemedicine use was 16.6% during the early pandemic period and 3.0% in the late pandemic period, respectively. This resulted in a telemedicine conversion rate of 5.1% and 2.5% of prior-year visits, respectively. The peak rate of telemedicine conversion was 8.2% of prior-year visits in April 2020, while the rate at the

end of the study period was 2.1%. Despite the increased use of telemedicine during this period, in-person visits still comprised the majority of new patient visits, with 98.9% (61,111 of 61,818) of total visits in 2019 during pre-implementation period 1 and 37.9% (33,343 of 88,003) of total visits in the prior year during period 3. Additionally, the number of visits after implementing telemedicine was low, but it gradually increased as the pandemic progressed. In the second quarter of 2020, the total volume of visits was 42.9% (37,791 out of 88,003) of the total visits in the previous year. During that time and into the third quarter, the total volume increased to a maximum of 88.7% (5,864 out of 6,610) of the prior year volume. By the end of the study, this figure had dropped to 80.6% (5,325 out of 6,610). This implies that the use of telemedicine was effective in increasing the total volume of visits, even during a pandemic. However, it also suggests that the total volume of visits did not reach the same numbers as the prior year.

Furthermore, the conversion rate in the majority of surgical specialties was lower than 10%. Neurosurgery and urology practices demonstrated the highest rates of telemedicine conversion, with mean rates of 14.3% and 13.8% respectively during periods 2 and 3. Urology had the greatest weekly telemedicine conversion rate of 24.8% in period 2, while neurosurgery had the greatest weekly telemedicine conversion rate of 20.7% in period 3. Telemedicine conversion rates gradually declined, particularly in urology. Orthopedics had the lowest mean telemedicine conversion rate of 2.3% during period 2, followed by ophthalmology/ENT with a mean telemedicine conversion rate of 0.3% in period 3. The mean telemedicine conversion rates for other subspecialties during period 2 were 3.2% for colorectal surgery, 4.9% for general surgery, 8.4% for obstetrics and gynecology, 5.3% for plastic surgery, and 7.6% for thoracic surgery. During period 3, these figures were 4.7%, 7.9%, 8.2%, 5.5%, and 2.5% respectively.

The low adoption of telemedicine in surgery in their study is concordant with other studies that have noted obstacles to its use in this field (32,34). Before the pandemic, surgery-related specialties were less likely to employ telemedicine than other areas of medicine. According to Kane and Gillis (32), the use of telemedicine among surgical disciplines was 11.4%, which was the lowest rate compared to other specialties, from 12.7% in primary care to 39.5% in radiology. Importantly, the authors discovered that even during the pandemic when telemedicine was a more secure form of care and insurance policies had been modified to guarantee remuneration, approximately 25% of surgeons were utilizing telemedicine for initial patient visits (34). When looking at telemedicine usage in general, 59% of all surgeons employed it (34). Revealing the complex adoption process of telemedicine in surgical practices.

Specialties that have the option to rely heavily on advanced imaging for diagnosis, monitoring, and virtual physical examinations may have an advantage when it comes to converting into a hybrid or teleconsulting service. This is particularly true for urology and neurosurgical services, given they were the highest in conversion rate (34), and were found to have higher than average diagnostic accuracy via teleconsulting amongst medical and surgical clinical areas (35).

Lastly, a recent article by Beheshti *et al.* (36) investigated the application of telemedicine in primary care, solidifying its growing significance as a tool for enhancing healthcare delivery. They included 43 studies from various countries and found that telehealth primarily caters to adults, with a particular emphasis on those aged 18–60. Furthermore, their findings reveal that telehealth is not limited by age, as even elderly populations are increasingly embracing this technology, provided they receive adequate support, more specifically from their families and close relatives who are acquainted with their disabilities or limitations. Additionally, they found that chronic conditions like diabetes and hypertension are the most common diseases monitored/implemented for telehealth interventions, presenting a potential solution to reduce the healthcare system's financial burdens. Real-time communication was the preferred approach. While challenges such as insurance coverage and technical barriers as such described previously are also present in primary care, the advantages of telehealth, including self-care promotion, cost reduction, and improved access to healthcare, signal its transformative potential in primary care delivery.

Discussion

Telemedicine has become increasingly popular in recent years, thanks to advancements in technology and the need for more accessible and efficient healthcare. Although a recent systematic review suggested that both patients and practitioners are generally satisfied with telemedicine (37) in their practice, the adoption varies among specialties. Specialties like dermatology, radiology, and psychiatry have been quick to adopt telemedicine, while surgical specialties and some medical specialties i.e., cardiology have been slower.

There are several possible reasons which could explain the disparity among specialties. First, certain specialties rely more heavily on the observations yielded from a traditional hands-on physical examination during an in-person visit and the capabilities of conducting an array of in-person diagnostic or therapeutic procedures, making it more difficult to transition to telemedicine. However traditional physical examinations are being challenged. The concept of a physical examination, including elements without touch such as visual inspection, observation, and listening is increasingly highlighted as important elements of telemedicine (38). Physician-guided patient self-examination may also be a suitable substitutions for a traditional physical examination in some instances (38). Surgical specialties may involve certain interactions that may not be suitable for telemedicine, such as obtaining consent for surgical procedures, delivering bad news, and conducting specific clinical examinations for surgical planning (39). In such cases, alternative measures should be considered and utilized.

Additionally, some specialties may require more specialized equipment or training to conduct telemedicine visits, which could slow down adoption. A recent systematic review analyzed the experience, feasibility, and limitations of using telemedicine in cardiovascular surgery. The authors concluded telemedicine was beneficial not only in managing patients' evolving health conditions, but also in enabling successful preoperative assessments, identifying cardiac deterioration, and handling any potential complications that may arise post-surgery. They highlighted the use of real-time teleconsultation to remotely analyze echocardiograms to triage patients for cardiac surgery (40,41), along with the interpretation of hand-held ultrasound for diagnosing most cardiovascular diseases (CVDs) (42). Furthermore, the authors highlighted the diagnosis accuracy for angiograms leading to referrals for procedures like coronary artery bypass graft (CABG) (40,43). However, some limitations were noted by the authors, such as the degree of training required to perform telemedicine consults by the physician, patient, and technician performing remote cardiac tests, and the difficulty in conducting a full physical examination in a virtual setting.

Despite efforts by the government and policymakers to improve reimbursement for telemedicine, some specialties may still not receive adequate reimbursement for virtual visits, making it financially unviable for them to adopt the technology. Policies and regulations must also consider the needs of different specialties and clinical illnesses, as some may require more resources or support than others. Insurance policies and reimbursement models should also be adjusted to ensure that all specialties are able to use telemedicine without financial penalties. Regular assessments of the utilization of telemedicine across different specialties and illnesses should also be conducted to understand the effectiveness of telemedicine practices and make any necessary adjustments. Some steps have been adequately taken by government and policymakers and with the help of new and improved legislation such as the CARES Act and regulatory waivers implemented by the Centers for Medicare and Medicaid Services (CMS), the telemedicine platform is increasing in popularity and could soon be the go-to option for delivering quality healthcare services, with many clinicians already depending on it as the primary means of providing care (5). These updated policies have enabled a significant expansion of telemedicine, broadening its reach to encompass various sub-specialties such as pediatrics, psychiatry, and surgical specialties, a far cry from its previous restrictions to certain fields of medicine (44-47). In fact, research conducted by the Oregon Health and Science University showed a substantial increase in telemedicine consults before and during COVID, increasing from 1,100 to 13,000 (48), following a national trend, with data from multiple centers showing an increase in telemedicine consulting of 50–154% from 2019 to 2020 (49). Furthermore, these trends have been observed even in other countries, as data collected from France, China, Brazil, and Switzerland have also indicated a profound rise in telemedicine consultations (50,51).

To address these disparities and ensure that all specialties have the necessary resources, training, and infrastructure several solutions can be implemented. First, additional training and resources can be provided to specialties that are slower to adopt telemedicine, including specialized equipment, tablets, or software and training programs for physicians and staff to become comfortable with virtual visits. Best practices and guidelines for conducting telemedicine visits can also be developed, particularly for specialties that require more specialized procedures. Incentives or reimbursement models can also be offered to encourage physicians to adopt telemedicine, particularly for specialties that are more resistant to change.

Future direction

Future research should explore the barriers that medical and surgical specialties face in adopting telemedicine and

develop strategies to overcome these barriers. This could involve surveys of patients, physicians, and other healthcare professionals to better understand their concerns and needs when it comes to telemedicine care. This could give us a better understanding of the unique challenges faced by different specialties, and by type of personnel, hence, researchers could develop tailored approaches to help these specialties successfully adopt and integrate telemedicine into their practices.

More studies focused on the evaluation, effectiveness and safety of telemedicine for different medical conditions, as well as examining the impact of telemedicine on patient outcomes, satisfaction, and quality of care, could continue to provide support for advocacy with government officials and policymakers for continuous improvement of such policies. Lastly, to improve the cost-effectiveness of telemedicine, new ways to optimize telemedicine workflows and processes, such as developing standardized guidelines for virtual consultations or exploring the use of remote monitoring technologies should be a priority as this could have a great impact on monetization policies and patient outcomes.

Limitations

The articles presented here have various limitations including a lack of standardization for codes in payment data which can lead to a difference in extracted data. Furthermore, reports have been focused on regional areas, and data has not been extracted for the whole country, which could influence results depending on the location, population, and characteristics of doctors in a particular region. Additionally, while we focused on surgical implementation, non-surgical specialties require a separate analysis which was not given in our article. Furthermore, our search and analysis of laws, and policies was limited to the USA. We did our best to provide a comprehensive analysis and understanding of the articles presented here, but a limitation our study has, common to all reviews, pertinent to an inadequate analysis of the data from the articles reported.

Conclusions

The data presented in this review has made it clear that the uptake of telemedicine services varies depending on the specialty and condition, due to the necessity of physical exams or tests. Despite the increased use of telemedicine during the pandemic, in-person visits still comprise the majority of new patient visits. It is important to note that telemedicine cannot completely replace in-person visits, however, it has been effective in increasing the total volume of visits and is a secure form of care. The uptake of telemedicine in medical practices exceeded that witnessed in surgical practices, however, amongst surgical practices the data suggests that neurosurgery and urology were the most frequent adopters. Ultimately, it is clear that although telemedicine has become a mainstay in healthcare since the pandemic, further research is needed to understand its appropriateness and effectiveness in different specialties and conditions (52).

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Footnote

Reporting Checklist: The authors have completed the Narrative Review reporting checklist. Available at https://mhealth.amegroups.com/article/view/10.21037/mhealth-23-28/rc

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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