


# The telemedicine experience: using principles of clinical excellence to identify disparities and optimize care

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## Abstract

The use of telemedicine has increased significantly during the Corona virus disease 2019 pandemic. This manuscript serves to identify the underlying principles of clinical excellence in telemedicine and to determine whether effective care practices can be generalized as a one-size-fits-all model or must instead be tailored to individual patient populations.

A survey assessing care quality and patient satisfaction for patients using telemedicine was created and administered via email to 2 urban cohorts of varying demographics and socioeconomic backgrounds: a population of patients with prior stroke and cerebrovascular disease, and a cohort of patients followed for interstitial lung disease. Results were compared across groups to determine the generalizability of effective practices across populations.

Individuals taking part in telemedicine were more likely to be White, more affluent, and woman, regardless of clinical diagnosis compared with a similar cohort of patients seen in-person the year prior. A lower-than-expected number of patients who were Black and of lower socioeconomic status followed up virtually, indicating potential barriers to access. Overall, patients who participated in telemedicine were satisfied with the experience and felt that the care met their medical needs; however, those who were older were more likely to experience technical difficulties and prefer in-person visits, while those with less education were less likely to feel that their questions were addressed in an understandable way.

When thoughtfully designed, telemedicine practices can be an effective model for patient care, though implementation must consider population characteristics including age, education, and socioeconomic status, and strategies such as ease of access versus optimization of communication strategies should be tailored to meet individual patient needs.

**Abbreviations:** ACGME = American College of Graduate Medical Education, COVID-19 = Corona virus disease 2019, ILD = interstitial lung disease.

**Keywords:** clinical excellence, Corona virus disease 2019, telemedicine

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## 1. Introduction

Though the Corona virus disease 2019 (COVID-19) pandemic has recently placed telemedicine into the spotlight, the field originally dates back to 1906 when Willem Einthoven, a Dutch physician, first used an electrocardiogram to record his patients' heart signals at a hospital nearly a mile away. In 1967, physicians at the Massachusetts General Hospital were able to relay medical information to patients several miles away at Boston's Logan International Airport using microwave transmissions,<sup>[1]</sup> but it was not until the mid-1970s that Thomas Bird officially coined the term telemedicine, derived from the Latin and Greek words "tele" and "medicus," to describe "healing from a distance."<sup>[2]</sup>

With advancements in technology, physicians have been able to deliver care to their patients at an increasing distance. However, the practice has been slow to gain widespread acceptance given concerns surrounding access, effectiveness, and reimbursement. When the COVID-19 pandemic resulted in widespread community lockdowns across the United States, physicians and their patients were forced to find alternative ways to engage, and the use of telemedicine rapidly expanded to meet the need, forcing both patients and the healthcare system to adapt.<sup>[3]</sup> The increasing number of patients now utilizing virtual visits for their medical needs provides an opportunity to determine best practices and improve the quality of care. Though the future of its practice post-pandemic is less clear, telemedicine

is likely to continue to be of use to at least a sub-group of patients and providers.

The Miller-Coulson Academy of Clinical Excellence at the Johns Hopkins School of Medicine highlights the need for clinicians to continue working towards clinical excellence in their daily practices.<sup>14)</sup> Launched in 2008, it was created with the mission to “recognize and promote excellence in patient care.” The Miller Coulson Academy for Clinical Excellence has identified 6 key domains by which to define excellence in clinical practice: Communication and Interpersonal Skills, Professionalism and Humanism, Diagnostic Acumen, Skillful Negotiation of the Healthcare System, Knowledge, and a Scholarly Approach to Clinical Practice. In this manuscript, we seek to improve the knowledge base within each domain by comparing patient responses from 2 distinct cohorts, in order to assess whether virtual care can effectively follow a one-size-fits-all approach or must be tailored to different patient populations.

## 2. Methods

### 2.1. Survey design and implementation

In order to determine the generalizability of care models across patient populations, a survey was designed to evaluate perceptions of telemedicine. The survey was administered to 2 distinct cohorts who participated in virtual video visits during the COVID-19 pandemic, a group of patients with prior stroke and cerebrovascular disease followed by the Neurology Department, and a group with interstitial lung disease (ILD) followed by the Pulmonary Division. These populations were chosen because prior to the pandemic, both clinics were co-located in the same clinic space at adjacent clinic times. Though distinct specialties and conditions, the televisits were similar in many respects. They were performed using the same virtual video platform. Follow-up visits lasted approximately 30 minutes, and new patient encounters lasted 1 hour. Each visit was similar to that of a typical in-person encounter, consisting of the review of interim history and medications by a physician, followed by an abbreviated examination and a discussion of the physician’s assessment and plan of care. A companion was able to be present if needed to aid in the history and physical examination. No vital signs were obtained. Examinations differed for each specialty and focused on the organ of concern. Appointment reminders were also consistent, both across groups and when compared with in-person visits. Patients received letters confirming their appointment as well as reminder calls 1 week and 2 days prior to the encounter.

This study was approved by our institutional review board. The survey was developed using Qualtrics and sent via email to 166 stroke and 256 ILD patients seen virtually by the Johns Hopkins Bayview Medical Center between February and August of 2020, the height of the COVID-19 pandemic when these clinics were closed to in-person visits and a virtual video visit was the only option. The remaining 21 patients seen virtually over that time period did not have a valid email address. Email reminders were sent weekly to potential participants for 2 weeks until there was no further increase in patient responses.

Roughly 25% of individuals seen via telemedicine completed the survey (27 stroke and 77 ILD patients). The survey consisted of 13 questions and evaluated patient perceptions regarding satisfaction, care quality, ease of access, effectiveness, and virtual versus in-person preference. Responses were recorded using a 5-point Likert scale (very positive, somewhat positive, neutral,

somewhat negative, very negative). In an exploratory factor analysis a principle components analysis was performed, along with calculation of the Cronbach  $\alpha$  coefficient, to evaluate the reliability and validity of the survey as a whole as well as for each component based on factor loading.

### 2.2. Statistical analysis

Each survey was linked to an individual patient, allowing for collection of additional clinical (co-existing medical problems, presence of a companion at visit), demographic (age, race, sex, years of education), and socioeconomic (median income based on zip code, occupation class—unskilled to professional) information. Stroke patients were compared with those with ILD; we hypothesized that they would in general be older, with more comorbid health conditions that may influence their perceptions of the telemedicine experience. The number and characteristics of patients seen over the 6-month period for each group were also compared with the same time period 1 year prior when all visits were in-person to determine if telemedicine was more or less effective in: reaching specific demographics (show-rate), and providing care (patient satisfaction) based on variables such as age, race, or gender. Student *t* tests and chi squared analysis were then used to determine factors across groups associated with positive responses for each survey category to evaluate differences patient satisfaction and care quality. Results were assessed with respect to the 6 key domains of excellence.

## 3. Results

### 3.1. In-person visits versus telemedicine visits

In total, 443 patients were seen via telemedicine in 2020 compared with 484 in-person visits the year prior. While the overall number of patients who followed up was similar when only the virtual option was offered, significantly fewer Black patients participated in virtual visits compared to those seen in-person the year prior, while a higher proportion of men followed up virtually, though greater than 50% of patients following up were women for both time periods (Table 1). Virtual patients also had a higher average median income than the in-person cohort.

### 3.2. Neurology versus pulmonary cohorts

There were significant differences between the Neurology and Pulmonary cohorts who were seen both virtually and in-person. Neurology patients tended to be older with more vascular risk factors, while pulmonary patients were more affluent with a higher level of education (Table 2). These group differences were less significant for those completing telemedicine encounters, possibly due to self-selection of patients choosing to participate in telemedicine.

### 3.3. Survey reliability, validity, and characteristics of respondents

In the exploratory factor analysis, the principle components analysis revealed 3 factors accounting for 97% of the variance. The alpha coefficient for the entire survey was high (0.832) as well as for each individual factor (0.733–0.911). Approximately 25% of patients participating in telemedicine responded to the survey (27 stroke, 77 ILD). Importantly, survey respondents appeared to be a fairly representative sample of those seen

**Table 1**  
**Differences in patient characteristics for those seen virtually compared to in-person the previous year.**

Population characteristics	In-person (n=484)	Virtual (n=443)	P value
<b>Demographics</b>			
Age, mean years (SD)	63.9 (14.4)	63.9 (13.9)	.916
Race, n black (%)	138 (28.6)	89 (20.1)	.014
Sex, n male (%)	179 (37.0)	196 (44.2)	.024
Median income, mean dollars (SD)	81,736.4 (33,567.3)	87,661.8 (35,114.1)	.009
Education, mean years (SD)	14.6 (3.3)	15.2 (3.5)	.114
Companion present at visit, n (%)	21 (12.9)	61 (13.9)	.755
<b>Occupation class</b>			
Professional, n (%)	50 (20.7)	50 (19.3)	.952
Intermediate, n (%)	72 (29.8)	79 (30.5)	
Skilled laborer, n (%)	72 (29.8)	81 (31.3)	
Semiskilled laborer, n (%)	37 (15.3)	35 (13.5)	
Unskilled laborer, n (%)	11 (4.6)	14 (5.4)	
<b>Medical co-morbidities</b>			
Atrial fibrillation, n (%)	65 (13.4)	53 (12.0)	.504
Hypertension, n (%)	325 (67.2)	288 (65.0)	.472
Hyperlipidemia, n (%)	259 (53.5)	204 (46.1)	.023
Diabetes, n (%)	130 (26.9)	89 (20.1)	.032

virtually with a few exceptions. Virtual patients were on average 63.2 years of age and 22.5% Black, while survey respondents were slightly older (66.8 years) and only 11.6% Black. Sex, years of education, median income, occupational status, and medical co-morbidities were otherwise similar. When comparing the Neurology to Pulmonary cohort, the mean age of stroke patients responding to the survey was 67.6 years, with the majority of patients (56%) in the 70+ age group. Sixty-three percent of respondents were women. The mean age of ILD patients was 66.3 years, with 47% falling in the 70+ age group. Only 52% were women. The pulmonary cohort was overall less cognitively impaired with fewer vascular risk factors.

**3.4. Satisfaction with telemedicine- differences among cohorts**

Though more pulmonary patients completed the survey, the feedback was similar across groups. See Fig. 1 for full details. Patients seen in both departments who completed the survey were mostly satisfied with telemedicine, but still preferred in-person visits. Patients reporting connectivity issues were older in age, highlighting that ease of access to care must be considered.

From the 27 neurology respondents, 70.4% were very satisfied with telemedicine, 14.8% somewhat satisfied, and 14.8% neither satisfied nor dissatisfied. 47.8% preferred in-person visits, 39.1% were neutral, and 13.0% preferred virtual encounters. The most common reason (72.7%) stroke patients preferred in-person visits was not due to technological concerns, though some (18.1%) reported difficulty, but rather that they preferred to see their provider face-to-face. Most respondents agreed that they would recommend telemedicine to friends or family (75.0% somewhat or strongly). Most respondents also agreed that their virtual visit helped them to understand ways to improve their health (79.2% somewhat or strongly).

From the 77 pulmonary respondents, 80.5% were very satisfied with telemedicine, 11.7% somewhat satisfied, and 5.2% neither satisfied nor dissatisfied. 54.4% preferred in-person visits, 33.8% were neutral, and 11.8% preferred virtual visits. For the patients who preferred in-person visits, the most common reason (75.7%) was again not technological difficulty, but rather that they preferred to see their provider face-to-face. Several patients who preferred in-person visits highlighted the need for routine pulmonary function tests and that they felt more comfortable having their physician listen to their lungs. From this cohort, no patients reported technological concerns. Most respondents strongly agreed that they would recommend telemedicine to friends or family (80.9% either somewhat or strongly). Most respondents also agreed that their virtual visit helped them understand ways to improve their health (75.4% either somewhat or strongly).

**Table 2**  
**Comparison of the neurology and pulmonary cohort.**

Population characteristics	In-Person (n=484)			Virtual (n=443)		
	Pulmonology (n=164)	Neurology (n=320)	P value	Pulmonology (n=259)	Neurology (n=184)	P value
<b>Demographics</b>						
Age, mean (SD)	59.3 (13.6)	66.2 (14.2)	<.001	63.8 (12.9)	64.2 (15.2)	.796
Median Income, mean dollars (SD)	90,382.9 (35,517.7)	77,413.2 (31,731.6)	<.001	89,858.4 (36,141.0)	84,617.6 (33,498.3)	.123
Race, n black (%)	51 (31.1)	87 (27.3)	.541	52 (20.2)	37 (20.1)	.057
Sex, n male (%)	48 (28.1)	133 (41.6)	.004	111 (42.9)	85 (46.2)	.486
Education, mean years (SD)	16.0 (3.5)	14.0 (3.1)	<.001	15.2 (3.3)	15.2 (3.8)	.935
Companion at virtual visit, n (%)	—	—	—	33 (12.9)	28 (15.2)	.486
Occupation class code			.545			.027
Professional, n (%)	28 (23.1)	22 (18.2)		30 (20.7)	20 (17.5)	
Intermediate, n (%)	35 (28.9)	37 (30.6)		54 (37.2)	25 (21.9)	
Skilled laborer, n (%)	36 (30.0)	36 (30.0)		41 (28.3)	40 (35.1)	
Semiskilled laborer, n (%)	19 (15.7)	18 (14.9)		15 (10.3)	20 (17.5)	
Unskilled laborer, n (%)	3 (2.5)	8 (6.6)		5 (3.5)	9 (7.9)	
<b>Medical co-morbidities</b>						
Atrial fibrillation, n (%)	17 (10.4)	48 (15.0)	.157	23 (8.9)	30 (16.3)	.018
Hypertension, n (%)	83 (50.6)	242 (75.6)	<.001	143 (55.2)	145 (78.8)	<.001
Hyperlipidemia, n (%)	68 (41.5)	191 (60.0)	<.001	111 (42.9)	93 (50.5)	.110
Diabetes, n (%)	31 (18.9)	99 (30.9)	.005	56 (21.6)	33 (17.9)	.436



Figure 1. Survey responses.





needs. This may indicate that physicians need to be even more aware of their communication skills and assessments of understanding when interacting with particular patient groups via telemedicine.

The need to adapt communication skills for telemedicine has been increasingly recognized, prompting the development of training modules to educate medical students in building rapport and trust through video visits.<sup>[8]</sup> Early literature shows that many patients report equal or greater satisfaction with physicians' communication in telemedicine compared with in-person visits.<sup>[9,10]</sup> One review found that 19 out of 21 included studies positively rated the efficacy of communication via virtual care. The review also noted equal satisfaction with rapport development, a skill that has been associated with patient satisfaction.<sup>[9]</sup> Enhancing communication skills during virtual visits, often referred to as, "websites manner," has been described as vital to engage in effective virtual visits.<sup>[11]</sup> Both verbal and non-verbal communication must be used to foster a richer connection between a patient and physician. Though touch, commonly employed in-person to show empathy and concern, is not possible in telemedicine, physicians may utilize other nonverbal cues such as pitch, pace, and tone of voice. One study examined over 49,000 entries of patient feedback after video visits in order to learn more about physicians' interpersonal and communication skills. The skills most effective for building rapport included facial expression, posture, and the use of gestures to enhance verbal communication and optimize the patient experience.<sup>[12]</sup>

#### 4.3. Professionalism and humanism

Humanistic care focuses on the individual who has the disease rather than the disease alone. Humanistic physicians display compassion towards their patients, patients' families, and other healthcare team members. Traits such as empathy and compassion allow physicians to display professionalism, upholding the highest standard of care.<sup>[13]</sup> While this study did not directly assess humanism, the high level of patient satisfaction suggests that humanism can be conveyed during telemedicine encounters.

#### 4.4. Diagnostic acumen

Diagnostic acumen describes the analytical ability of clinicians to reach a correct diagnosis.<sup>[13]</sup> This typically requires the provider to first gather information from a patient's verbal history. In many cases the physical examination is then used to confirm the diagnosis before creating an appropriate treatment plan. However, over the years the instruments used to examine a patient and to make an accurate diagnosis have evolved beyond a physician's fingertips or stethoscope. The incorporation of diagnostic measures like chest x-rays and magnetic resonance imaging (MRI) are now routinely used to uncover what cannot easily be evaluated by the human senses.

Similarly, when separated by distance, physicians' diagnostic acumen must adapt, relying more on the verbal history and potentially integrating additional resources to compensate for the lack of the ability to "touch."<sup>[14]</sup> We saw in our study, that patients with pulmonary disease often preferred to be seen in person so that they could undergo pulmonary function tests or the physician could "listen to [their] lungs." Interestingly, individuals with hypertension felt that they were able to receive the same high quality care through counseling and medical management, which suggests the importance of the patient's

perception of their physician's ability to accurately assess their medical status online. Some fields may be more easily adapted to telemedicine based on the diagnostic and monitoring strategies employed.

The field of mobile health, integrating apps, and wearable technologies to record health measures is rapidly evolving. These technologies are promising as they offer the potential for physicians to assess a patient's health status at more frequent intervals and outside a medical setting, thereby having more information to make clinical decisions and maximize outcomes.<sup>[15]</sup> Mobile technologies such as sensors linked to a smartphone to record heart rhythms, wireless scales to monitor and transmit weight information to electronic medical records, and sensors placed under the skin for continuous glucose monitoring highlight the incorporation of technology in medicine. Though more research is needed to assess the ability of mobile health technologies to improve outcomes, they are promising as they allow more health data to be collected for physicians to make informed decisions and manage diseases. While it is currently unclear the impact these tools will have on diagnostic acumen, a study showing that the diagnosis of Mild Cognitive Impairment and Alzheimer Disease was the same in an in-person and virtual setting is encouraging that it may be possible to find the right tools to effectively diagnose multiple medical problems at a distance.<sup>[16]</sup>

#### 4.5. Skillful negotiation of the healthcare system

The healthcare system is difficult to navigate, especially for populations with lower health literacy. Stroke survivors and their families often struggle with the complexities of the healthcare system post-hospital discharge.<sup>[17]</sup> Neurologists have the ability to support and guide patients through the healthcare system, improve outcomes, and reduce hospital readmission rates through patient education. Telemedicine provides the unique opportunity to see patients who may not be otherwise able to return for an in-person appointment; however, if they do not have access to a computer, or are not technologically savvy, telemedicine may be overwhelming and difficult. In our study, we found that patients who were older had more difficulties with accessing the virtual platform and uniformly preferred seeing their provider in person, even if it was less convenient. However, this may not be the case even for all patients of advanced age. The ability to follow a patient in a nursing home without having to arrange for transportation that can be costly, time consuming, and for some complex patients even medically risky, is a potential benefit, increasing access to care and allowing experts to be more regularly involved in care planning for this vulnerable population to prevent hospitalizations and complications. The question of reimbursement will likely significantly influence this practice post-pandemic, but potential benefits are obvious.

It is critical to point out that the number of black patients returning for follow-up over the virtual period was significantly lower than those seen in person the year before, while the median income of the population was significantly higher for virtual visits, suggesting that minorities and individuals in lower socioeconomic brackets were less likely to return for visits when they required a virtual platform. In addition, a lower percentage of black patients responded to the survey, which may also suggest the requirement for advanced technology or resources such as a smartphone or internet as potential barriers for access, and that the survey responses may not be fully representative of this

population. Our results illustrate that while those who engaged in telehealth visits reported that they were happy overall with their experience, it may not be readily accessible for all groups, a significant concern. Consideration of health care disparities will be critical in continuing to build successful telemedicine platforms to effectively reach the greatest number of patients regardless of age, sex, race, or socioeconomic status.

Telemedicine has also been noted to increase family involvement in patients' health.<sup>[18]</sup> With research showing an association between high levels of social support and functional status after diseases like stroke, physicians have an opportunity to facilitate communication and improve care coordination. The ability to include additional family members from multiple locations who may not be able to come to a clinic visit provides a way to ensure that everyone understands the plan of care, making it more likely to be followed and for the patient to be successful at remaining healthy. While we noted similar numbers of companions participating in both virtual and in-person visits, anecdotally, multiple family members were able to participate using online platforms.

#### 4.6. Knowledge

It is imperative that physicians continue to educate themselves on the ever-changing guidelines and protocols in telemedicine as technology in medicine evolves. More efforts must be made in education to equip future healthcare providers with the knowledge to serve patients in the field of telemedicine. This study did not assess physician knowledge and comfort with use of telemedicine. Though more research is needed to assess the incorporation and implementation of more education into medical schools as well as residency programs, one review aimed to measure exposure to telemedicine in the medical field by looking at the 2018 ACGME Milestone Report for evidence of a telemedicine competency within each residency's curriculum. Not surprisingly, Child and Adolescent Psychiatry was the only specialty to mention telemedicine in their ACGME Milestone Report.<sup>[19]</sup> In an effort to keep providers up to date on guidelines ranging from privacy to documentation, many organizations, such as the American College of Physicians, have launched online learning programs in providing virtual care.<sup>[20]</sup>

#### 4.7. Scholarly approach to clinical practice

Research leads to better understanding and treatment of diseases, resulting in better long-term outcomes. Advances in research have led to improved treatment and quality of care. Clinically excellent physicians remain informed of current research as they appraise published literature, identify pertinent material, and apply it to their clinical care practices. Many clinically excellent physicians also take the next step and contribute to research by generating novel insights.

Five domains of opportunities in telemedicine research have been identified and include: access to care, cost, cost effectiveness, patient experience, and clinician experience.<sup>[21]</sup> Given the rapid increase in telemedicine practices, much of what is currently reported regarding its effectiveness and patient experience is limited. One systematic review of 2193 articles related to telemedicine and patient satisfaction found only 44 articles deemed relevant and in English. This review found that the factors most associated with telehealth and effectiveness were improved outcomes, preferred modality, low cost, ease of use,

improved communication, and decrease in travel time.<sup>[22]</sup> While this review evaluated all papers relating to telemedicine and satisfaction, papers using surveys to evaluate telemedicine are currently limited to the rural medicine, pediatrics, psychiatry and are also emerging in the fields of otolaryngology, orthopedics, and endocrinology.<sup>[23–27]</sup> These surveys all showed a high percentage of satisfaction with telemedicine visits, as patient satisfaction survey results ranged from 80% to 97%. This is consistent with our findings in this study. We hope that with studies such as ours, we can continue to use evidence-based approaches to improve patient satisfaction, clinical outcomes, and quality of care.

#### 4.8. Limitations of this study

This study has a number of notable limitations. It examines a relatively small population of patients at a single institution over a short period of time during which telemedicine was the only option for clinical follow up. In addition, it relied on email responses which may have limited the responses to those with valid email addresses and resources allowing them access to advanced technology. Further follow-up by phone may help to expand the population and generate additional responses. In addition, the study compared 2 clinically distinct patient cohorts—a predominantly acute post-stroke neurology population, and a chronic interstitial lung disease population. These 2 cohorts represent vastly different disease processes and some of the differences noted in the impact on telemedicine could result from the underlying disease. For instance, patients with cognitive impairment might experience more difficulty in accessing telemedicine. However, this highlights the importance of assessing the acceptability of telemedicine in diverse populations and considering how it might be adapted to needs of specific patient groups.

### 5. Conclusions

Telemedicine provides a unique opportunity to expand care to groups of individuals who may be unable or hesitant to seek care in the traditional in-person setting. As the field expands, new questions will arise seeking to better understand the efficacy and patient satisfaction of medical care delivered via telehealth, particularly as it relates to various groups within our medical system. Factors such as age, race, education, and socioeconomic status are important considerations when considering the efficacy of telehealth across populations. While physician reimbursement will likely drive the field in the post-pandemic state, we must not lose sight of these other potential barriers, particularly as, once identified, many are addressable. Though literature is emerging in the field, more initiatives are needed to optimize patient preferences and clinical outcomes.

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