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Patient Experiences with Ambulatory Telehealth in Neurology: Results of a Mixed Methods Study

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ABSTRACT

Objective: To assess patient experiences with rapid implementation of ambulatory telehealth during the COVID-19 pandemic.

Methods: A mixed methods study was performed to characterize the patients' experience with neurology telehealth visits during the first eight weeks of the COVID-19 response. Consecutive patients who completed a telehealth visit were contacted by telephone. Assenting patients completed a survey quantifying satisfaction with the visit followed by a semi-structured telephone interview. Qualitative data were analyzed using the principles of thematic analysis.

Results: 2,280 telehealth visits were performed, 753 patients (33%) were reached for post-visit feedback. Of these, 47% of visits were by video and 53% by telephone. Satisfaction was high with 77% of patients reporting that all needs were met though only 51% would consider telehealth in the future. Qualitative themes emerged suggesting that positive patient experiences were associated with elimination of commute time and associated costs as well as a positive physician interaction. Negative patient experiences were associated with the inability to complete the neurologic examination. Overall, patients tended to view telehealth as a tool that should augment, and not replace, in-person visits.

Conclusion: In ambulatory telehealth, patients valued convenience, safety, and physician relationship. Barriers were observed but can be addressed.

INTRODUCTION

Telemedicine has been utilized in neurology since the early-2000's with the implementation of telestroke.^{1,2,3} Not only did this technology provide a safe alternative to in-person care, but it also expanded access to acute specialist-driven care for patients within the therapeutic window for ischemic stroke interventions, and is now the standard in acute stroke when an in-person neurologist is unavailable. Since then, telemedicine has been used in other areas of neurology to improve healthcare access. This has been particularly beneficial for patients who reside in areas without access to subspecialty neurologists, or have barriers to care such as limited transportation, mobility concerns, or caregiver needs.⁴

Prior studies have demonstrated the clinical and financial benefits of telehealth including elimination of travel expenses, travel time, and improved triage of patients needing tertiary care.^{5,6,7} Barriers have also been identified including specific exam techniques (e.g. deep tendon reflexes, fundoscopy) in neurology.^{4,8} Widening health disparities were revealed, as older, male, black patients with Medicare or Medicaid insurance were less likely to adopt video visits.⁹ In response to the coronavirus (COVID-19) pandemic, telehealth has increased exponentially. Moving forward, a telemedicine-driven paradigm shift care delivery may persist into the post-pandemic era. Specifically, the implementation of web-based applications which support appointment scheduling, online consultation, test result follow-up, prescription completion, medication delivery, and most importantly, health insurance coverage, has been shown to increase patient familiarity with and utilization of telemedicine services.¹⁰ Further studies will be necessary to assess the utility of virtual platforms in advancing clinical research via pre-trial screening, participant training, or real-time video evidence of participants complying with pharmacological treatment.

No prior study has comprehensively assessed the current and future role of telehealth in ambulatory neurology through qualitative exploration of the patient experience. We sought to quantify and characterize the patient perspective during implementation of telehealth in the neurology ambulatory setting.

METHODS

Design. A sequential mixed methods study was conducted including: (1) quantitative survey of patients undergoing ambulatory telehealth visits, and (2) qualitative assessment of post-visit telephone interviews to characterize the benefits, challenges, and patient recommendations.

Ethics. This study was reviewed and approved by the Wake Forest School of Medicine institutional review board (IRB#00065375).

Standard Protocol Approvals, Registrations, and Patient Consents. This study was classified as Expedited Category 5. It meets criteria for a waiver of consent and a waiver of HIPAA authorization.

Intervention. In response to the COVID-19 pandemic, the Department of Neurology at Wake Forest Baptist Medical Center rapidly implemented ambulatory telehealth as previously described.⁷ All clinic visits for new and established patients of all ages were converted to telehealth visits, except for urgent complaints when emergency care was in question.

Appointment schedulers offered video visits as the preferred modality and a telephone visit was only scheduled if a video visit was not possible. Ambulatory clinical staff adapted their training to support telehealth visits. Certified Medical Assistants (CMAs) were given standardized

training on scheduling new visit types, scripting on how to discuss logistics with patients, and stepwise instructions on guiding patients through technology and software. CMAs contacted all patients and rescheduled in-person clinic visits to telehealth visits.

All patients who completed an ambulatory telehealth visit between March 24 – May 8, 2020 were contacted for participation. One of eight study team members (C.O., S.T., K.D., A.A., L.S., A.S., L.S., C.C.) contacted each patient by telephone within one to four weeks of the appointment. Patients were contacted once and no voicemails were left. Quantitative and qualitative feedback were gathered from patients who were successfully contacted and verbally assented. Patient reasoning for choosing not to participate in the study included the following: the patient hung up the telephone, was unavailable or busy, did not recall the specific telehealth visit under question, had rescheduled the televisit to a later date, was Spanish speaking only, could not hear the survey administrator due to poor phone connection, or in rare cases, had deceased.

Quantitative Methods. Assenting participants were asked three multiple choice questions to quantify: (1) the type of telehealth visit, (2) whether the telehealth visit met the patient's needs (4-point Likert: [4] all needs were met; [3] some needs were met; [2] a few needs were met but not all, because this was a telehealth visit; and [1] needs were not met because this was a telehealth visit), and (3) whether the patient would consider a future telehealth visit (4-point Likert: [4] definitely want a future telehealth visit; [3] might consider; [2] only consider it if required; and [1] would not consider). Questionnaire responses were summarized using descriptive statistics. Relative proportions of each question were calculated and compared between patients undergoing video versus telephone visits.

Qualitative Methods. After answering three multiple choice questions, assenting participants were prompted to provide general feedback including surprises, challenges, or benefits that they experienced from meeting with a neurologist through video or telephone. A semi-structured interview prompt was utilized. Patient responses were documented verbatim. Patient responses were analyzed using Strauss and Corbin's constant comparative method for thematic analysis. An initial codebook was developed by two study facilitators (C.O., S.T.) using a random sample of 100 patient responses. These two study facilitators independently coded 50 patient responses and then debriefed to compare codes, discuss discrepancies, add or amend codes, and revise the codebook. This process was successively repeated two additional times for a total of 150 coded responses. Two study facilitators (C.O., S.T.) individually coded the remaining patient responses. The codes were then closely compared and revised, when needed, to ensure code accuracy. Response codes were analyzed for thematic redundancies and generation of representative meta-themes and sub-themes for the data set, including distinctions among emergent themes based on type of telehealth visit (i.e. video visit vs. telephone visit).

Data Analysis & Synthesis. Quantitative and qualitative data were collected contemporaneously and synthesized at analysis. Quantitative results were analyzed first. Descriptive statistics were performed. To compare patient feedback by visit type, responses were dichotomized (4 vs 1-3) and two-sided Fisher's exact test used with predetermined statistical significance of $\alpha < 0.05$. Trends of interest were further explored in qualitative analysis.

Data Availability. The data that support study findings are available upon request.

RESULTS

Demographics. Between March 24 – May 8, 2020, 2,280 patients completed an ambulatory telehealth visit and were contacted with post-visit telephone call. Contact was successfully made with 858 patients (38%); 753 assented (33%). Reasons for choosing not to participate included lack of time or interest, failure to recall the specific visit, or inability to speak English. All assenting participants completed three quantitative multiple-choice questions. Of these participants, 551 chose to also respond to a single open-ended qualitative question. The 202 patients who chose not to answer the qualitative question stated, “no comment.”

Mean age was 47.6 ± 24.2 years. Participants identified as White or Caucasian (80%), Black or African American (14%), Asian (<1%), and Other (6%), or they did not define their race (0.4%); 145 identified as female (56%). Sex did not significantly differ between participants who completed video versus telephone visits. Participants who completed video visits were younger (42 years vs. 52, $p < 0.00001$) and more likely to identify as White or Caucasian (85% vs. 75%, $p = 0.00122$) (Table 1).

Non-participants who were not successfully contacted or chose not to participate in the study ($n = 1,527$) had similar demographics including age (43.6 ± 24.0 years); White or Caucasian (77%), Black or African American (16%), Asian (1%), other (6%), or did not define their race (<1%); and female (60%). Visit type was similar for participants (41% video, 52% telephone, 7% converted from video to telephone) and non-participants (48% video, 52% telephone) (Table 1).

Quantitative Study Results

The majority of participants reported that “all” needs were met with their telehealth visit (77%, Table 2). Needs were met equivalently by the ambulatory telehealth visit regardless of visit type

(Table 3). Though only 51% would “definitely” consider, another 25% “would consider” a future telehealth visit and an additional 21% would consider a future telehealth visit if required (Table 3). When stratifying by visit type, 57% of patients who completed video visits would “definitely” consider a future telehealth visit compared to 46% of patients who completed a telephone visit ($p=0.049$).

Qualitative Study Results

A total of 551 responses were coded and six major categories describing the patient experience emerged including: (1) attributes of a positive experience, (2) attributes of a negative experience, (3) experiences with telehealth unique to COVID-19, (4) comments regarding the technology used, (5) factors required to facilitate ambulatory telehealth in neurology, and (6) recommendations for future telehealth visits (Table 4).

Attributes of a Positive Ambulatory Telehealth Visit. 32% of all qualitative responses described attributes of a positive telehealth experience. These included the general benefits of ambulatory telehealth (37% of codes), the overall pleasant experience (36%), factors that contributed to a positive patient experience (26%), and guidelines for future telehealth (1%).

Benefits of Telehealth

The most frequently cited benefit of telehealth was the elimination of commute time, inconveniences of finding and paying for parking, and lost time at work. Together, these accounted for 78% of all codes relating to the benefits of telehealth. Participants also commented on the convenience of telehealth, especially for people with limited mobility (10% of codes in this category). Participants indicated that they were satisfied with timely physician communication, which allowed prompt response to patient questions and

concerns (6%). Participants were thrilled by the elimination of wait time outside of the physician office (3%), and that telehealth expanded access to rural and out-of-state areas (3%).

General Satisfaction

Participants often offered general positive feedback with no further elaboration (36% of codes) saying, “It was great. I would do it again.”

Features that Contributed to a Positive Telehealth Experience

The main feature of a positive experience was a positive physician relationship, described in 84% of codes. Additional features that contributed to a positive experience included administrative staff who helped patients navigate the logistics of transitioning from in-person to telehealth visits (9%), and the belief that telehealth allows for a comprehensive physical exam (7%). Regarding a positive physician relationship, one patient shared, “she's very detailed and if she doesn't know something, she will look it up. She really wants to help her patients, we really trust her opinion, and we wouldn't have anyone else.”

Patient Parameters for Future Use of Telehealth

Participants (1%) remarked that they “will continue to use telehealth if insurance covers visits in the future.”

Attributes of a Negative Ambulatory Telehealth Visit. 14% of all qualitative responses described attributes of a negative telehealth experience including specific reasons for an unfavorable experience (73% of codes) and limitations of telehealth services (27% of codes).

Specific Reasons for a Negative Telehealth Experience

The most frequently cited reason for a negative telehealth experience was the absence of a comprehensive physical exam, which accounted for 47% of all codes in this category.

One patient said, “I just don't think he can see me and the way I'm walking, or my strength, with the video visit. He can only hear what I can tell him.” Other reasons reported by participants included unanswered questions and/or outstanding concerns (25%), delayed administrative tasks between physician and laboratory offices or pharmacy (9%), negative physician interactions (8%), billing concerns (5%), miscommunication (4%), and inconvenient wait time from the point of patient login to being seen in the online portal (2%).

Limitations of Telehealth Services

Limitations identified by patients included: (1) unavailable services such as blood draws, nerve conduction tests, or medication injections (48% of responses in this category), (2) ambiguities or errors associated with self-reported symptom progression, improvement, or recurrence (42%), and (3) increased communication difficulties owing to hearing impairment, language insufficiency, or differences in phonation and pronunciation (10%).

COVID-19-Specific Experiences with Telehealth. 20% of all qualitative responses described opinions regarding telehealth in the context of the current coronavirus pandemic. This included patient preference for in-person visits despite possible exposure to the virus (54% of codes in this category), patient acceptance of telehealth as a suitable alternative during the pandemic (23%), patient preference for telehealth visits over in-person visits (9%), patient appreciation of safety

and protection from unnecessary exposures (8%), and patient preference for video visits over telephone visits during the pandemic (6%).

Telehealth Technology Satisfaction and Limitations. 10% of all qualitative responses commented on the technological infrastructure used to facilitate telehealth visits. These included details regarding technical difficulties such as video conferencing system failure, user unfamiliarity, and sub-optimal internet connectivity (69% of codes in this category), reports of successful software set-up and use (19%), and recommendations to improve the virtual telehealth framework (12%).

Factors Needed for Successful Implementation of Ambulatory Telehealth in Neurology. 6% of all qualitative responses detailed three elements to increase the successful implementation and integration of ambulatory telehealth in daily clinical practice of neurology. These include: (1) patient empowerment through patient education about diagnosis, symptom management, medication management, and prognosis (90% of codes in this category), (2) encouragement of social support through family/caregiver-assisted history and physical examination (6%), and (3) improvement in telehealth accessibility through family/caregiver assistance with software and technical equipment (4%).

Recommendations for Scenarios Appropriate to Future Telehealth Visits. 15% of all qualitative responses commented on specific scenarios in which telehealth should be maximized in the future. These scenarios include: (1) follow-up appointments for established patients as opposed to new patients (35% of responses in this category), (2) patients with stable diagnoses or visits depending on patient needs (28%), (3) visits that do not require any in-person services (16%), (4) non-emergent chief complaints (8%), (5) medication management visits (8%), and (6)

children and adolescent visits that do not require an extensive physical exam (3%). Specific anecdotes from patients include, “it was just a follow-up. It was perfect; it was all we really needed” and “with my history of three heart surgeries and stroke, I just prefer an in-person visit. But if it was a sinus infection or bladder infection, I would have no problem doing a telehealth visit.” Notably, 2% of responses described difficulty with completing telehealth visits for toddlers who have limited attention span and require close supervision at all times.

Positive Attributes According to Type of Telehealth Visit. The distribution of meta-themes was similar when analyzing by visit type (i.e. video vs. telephone visit) (Table 5 & 6). Patients completing video visits were more likely to discuss positive attributes of an ambulatory telehealth visit (38% vs. 31% of telephone users) and less likely to discuss negative attributes (12% vs. 15% of telephone users). Among participants who commented on the benefits of telehealth, the elimination of commute time was the most frequent response across both video and telephone visits (80% and 78%, respectively). The convenience of telehealth for patients with limited mobility was more likely to be valued for patients completing telephone visits (12% vs. 7%). Of the patients describing features of a positive experience, 94% of telephone participants indicated that a positive physician relationship was essential, compared to only 73% of video visit participants. Video visit participants were more likely to value helpful administrative staff support (15% vs. 3%), and view the virtual physical exam as adequate (12% vs. 3%). This sentiment is emphasized by the following patient comment, “the video visit was on time, I was given instructions on what to do the night before, and I was told to log-on a few minutes before. It worked more or less how I expected.”

Negative Attributes According to Type of Telehealth Visit. Among patients who described reasons for a negative telehealth experience, patients who completed a video visit were more

likely to cite the lack of a comprehensive neurological exam and inconvenient wait time compared to telephone visits (28% and 0%, respectively). Among reasons for a negative telehealth experience, patients completing telephone visits were more likely to report remaining questions or outstanding concerns (35%) as well as miscommunication issues (7%) compared to video visits (21% and 0%, respectively).

COVID-19-Specific Experiences According to Type of Telehealth Visit. Of the participants who shared opinions regarding telehealth in the context of the COVID-19 pandemic, 57% of patients who completed telephone visits commented on wanting future in-person visits over telehealth visits, while the remaining 43% of patients commented on: (1) telehealth visits as a suitable alternative given the dangers associated with the pandemic, (2) increased safety offered by telehealth, (3) preference for telehealth over in-person visits, and (4) preference for video visits over telephone visits. Of those who completed video visits and commented on COVID-specific experiences, 49% of patients desired in-person visits over telehealth visits, whereas 29% of patients agreed that telehealth was a suitable alternative, 9% recognized the increased safety associated with telehealth, and 13% preferred telehealth over in-person visits.

Limitations of Technology According to Type of Telehealth Visit. Of those who discussed dissatisfaction with technology, technical system failure was cited by 73% of patients completing a video visit compared to 43% of telephone visits. In contrast, user unfamiliarity was discussed by 38% of patients completing telephone visits compared to 23% of video visits.

Factors Needed for Successful Telehealth Integration & Recommendations for Future Video and Telephone Visits. Patients who completed telephone visits were more likely to discuss the need for social support such as family members or caregivers when conducting the

history and physical exam (6% telephone vs. 0% video). For instance, one telephone user shared that her husband has a difficult time speaking, so she had to “translate his answers” to the physician. However, patients who completed video visits were more likely to discuss the need for assistance in setting up the technical equipment and software (7% of video users vs. 0% of telephone users). When noting specific scenarios in which future telehealth use would be optimal, telephone users were more likely to consider utilizing telehealth for treating non-emergent conditions (11% telephone vs. 4% video) and for aiding in medication management (13% telephone vs. 0% video).

DISCUSSION

The COVID-19 pandemic was a catalyst for expanding the utilization of telemedicine in clinical neurology. However, the ability of telephone and video visits to adequately meet patients’ needs and provide care in an equivocal manner to the in-person setting has yet to be thoroughly examined. By investigating patient experiences with telehealth through both quantitative and qualitative methods, this study provides several important findings. First, we confirm that the overall experience is positive, with >75% of patients reporting that all their needs were met, regardless of modality. Positive patient experiences were frequently attributed to the elimination of commute time and associated finances including gas, parking, and accommodation costs, as well as a positive physician interaction and relationship. Second, negative patient experiences were most frequently attributed to the inability to complete a traditional neurological examination. Third, patients perceive technology (including software, internet connection, and user ability) as a barrier to telemedicine. Lastly, patients tend to view telehealth as a tool that may augment traditional means of providing healthcare, rather than a replacement for in-person visits altogether.

With reduction of transportation burden, one of the greatest potential benefits of telemedicine is its ability to expand access to care, particularly to subspecialists.¹¹ Previously, telemedicine has been shown to increase patient adherence to clinical recommendations, expand access to subspecialty services, allow healthcare to be provided in rural areas where patients would otherwise have to travel long distances to see a provider, and facilitate out-of-state care.^{12,13} Of these known findings, however, out-of-state coverage was only mentioned by 3% of respondents who commented on the benefits of telehealth in the current study, and no patients specifically mentioned the ability to improve access to subspecialty services. This may be due to the evolving policies surrounding out-of-state telemedicine provision and implementation, though this study was performed at an early time in the pandemic when telehealth coverage had expanded most broadly. Alternatively, this may be due to few or no individuals being out-of-state among the surveyed population. Patients were far more likely, across both video and telephone visits, to comment on the ability of telehealth to eliminate commute time or associated travel finances, often calling it “convenient” and “comfortable.” Patients, especially those who had a telephone visit, emphasized telehealth’s convenience in the setting of limited mobility due to ischemic strokes, demyelinating central nervous system lesions, or in the setting of driving restrictions due to vision loss or epilepsy.

Beyond access to care, an additional factor that strongly contributed to a positive telehealth experience was the patient-physician relationship. This association has been well documented for in-person experiences, as positive patient-physician interactions have been shown to improve patient satisfaction, improve healthcare outcomes, and even decrease malpractice lawsuits.^{14,15} In our study, patients were equally likely to provide general positive comments about their physician (e.g., “he is amazing”) as they were to comment on the provider’s ability to diagnose, treat, and educate patients (e.g. “it was informative and she answered all of my questions”).

Interestingly, patients who completed a telephone visit reported a relatively stronger reliance on patient-physician relationship when compared to patients who had video visits. This may be due to the fact that video visits allow for interpersonal connection via both sight and sound, compared to only the sense of hearing in a telephone visit. Moreover, those who had a video visit were more likely to comment on the value of administrative staff in setting up the visit. In both cases, communication with the patient was critical to a positive patient experience. In the case of video visits, frequent communication and support from staff will be important moving forward (e.g. “your doctor will be with you in 5 minutes”, “this is how you turn on your camera”, etc), while a focus on clear and direct verbal communication from providers is essential with telephone visits.

In comparison, negative patient experiences were often attributed to the inability to perform the complete neurological examination. Although video visits, rather than telephone visits, were primarily offered during the scheduling of telehealth appointments, only 47% of visits in this study were conducted via video. Patients frequently specified that physicians could not accurately assess gait, strength, ocular abnormalities, and reflexes, and they were concerned that this limited the provider’s ability to assess their symptoms. In this cohort, patients were more likely to “definitely” consider a future video compared to telephone visit. This prompts postulation regarding the impact of the virtual physical exam on visit satisfaction and consideration of future telehealth visits. When the dataset was stratified based on type of visit, a larger proportion of patients with video visits—not patients with telephone visits—were unsettled by the lack of a comprehensive neurological examination. This is likely due to differences in patient expectations. A limited or absent physical exam is a known limitation of the telephone visit; thus, patients do not expect an examination to be attempted over the telephone. Instead, patients placed greater emphasis on communication and having all questions

answered. Patients completing video visits held providers to a different standard due to the inherent capability of this modality.

As telehealth is a new modality to many providers and patients, it is not surprising that technology barriers were frequently mentioned. These barriers included difficulty with video conferencing, problems with internet connection, poor audio or video quality, and user proficiency. Technical system failure was much more commonly reported among patients completing video visits, likely due to factors that are outside of the patients' control (e.g. internet connection, poor video resolution, sub-optimal audio quality, etc.). Comparatively, patient unfamiliarity was prominent among telephone visits and may even suggest a reason for patient reluctance to attempt a video visit. However, it is also notable that 15% of patients completing video visits detailed a positive experience with the process of setting-up relevant equipment, software, and virtual applications, which is likely due to the increased logistical burden of the video visit compared to the telephone visit. This finding further reinforces the importance of technological support staff in a telehealth workflow. Technologically adept family members and caregivers were perceived to play an integral role in improving telehealth's accessibility and sustainability. Suggestions for improving the virtual telehealth framework included: (1) using an online queue wherein patients can identify if they are next in line on the physician's schedule, (2) implementing dual or triple appointment reminder alerts using any combination of encrypted voicemail, text message, or email, in addition to the health portal, and (3) transitioning to a "more enterprised" video conferencing system that is standardized, reviewed, and approved by the institution to uphold the highest standards of care.

Ultimately, participants tended to view telehealth as something that should augment traditional means of providing healthcare, rather than as a replacement for in-person visits altogether. This

patient perspective is critical as providers and health systems find a new normal in delivering ambulatory care after the COVID-19 pandemic. Participants indicated that they would be most comfortable with the use of telehealth for established care of patients when an in-person physical exam or additional testing is not required. Many patients acknowledged that in-person visits are necessary for certain physical services such as labs, shots, or imaging studies, which may explain why some patients still prefer the in-person visit despite the advances in telehealth capabilities. During the pandemic, patients completing video visits were more likely to appreciate telehealth's ability to increase patient safety.

Clinical models implemented post-pandemic will incorporate the patient perspective as well as staff and provider workflows and adequate reimbursement. Future studies will assess how the patient perspective changes as technological barriers are improved and familiarity with telemedicine increases. Future technological advancements, such as utilizing machine learning tools to objectively gather and trend physical exam data (e.g., extraocular movements, gait patterns) is one example that may influence preferences over time. Communication, or lack thereof, was frequently cited as contributing to positive and negative telehealth experiences. Continued medical education for providers, and perhaps medical school trainees, must shift to incorporate formal telehealth training in an effort to improve provider communication.

Strengths of this study include the large, clinically diverse population and rigorous documentation of patient feedback by semi-structured interview soon after the appointment. Determination of telehealth visit type was confirmed by interview. This question corrected visit type for patients who converted from video to telephone, but is limited by recall bias. By defaulting visits to video, patient preference did not confound visit type.

This study is not without limitations. Due to the statewide stay-at-home order during the first week of telehealth implementation, visits were canceled. This resolved rapidly within five weeks when ambulatory visit volumes returned to pre-COVID levels, though this could influence early patient feedback. The study population is restricted to this single academic institution and may not be generalizable to all ambulatory neurology practices. Patients were contacted soon after their visit, but not all patients were able to be reached. Many patients commented on the limitations of telehealth technology including software malfunction and user unfamiliarity. This may be attributed to the timing of the study during the early pandemic response. Opinions regarding technological limitations have likely evolved as the novelty of the technology has worn off and users are now increasingly familiar with platforms. Telehealth software has also undergone rigorous updates to improve user-friendliness and functionality.

The patient voice is critical in defining the optimal role of telemedicine in neurology. Future models will focus on telehealth as an adjunct to traditional in-person visits while maintaining closed-loop verbal and written communication, immediate access to after-visit summaries, pending lab orders, and available appointment dates. Patients value the convenience of telehealth, particularly when they already have an established relationship with their provider. The telehealth patient experience may be improved with involvement of administrative staff, caregivers, social support, and emphasis on communication strategies that facilitate the virtual patient-physician relationship.

Appendix 1.

Name	Location	Contribution
Carly Olszewski	Wake Forest Baptist Health, Winston Salem	Major role in the acquisition of data; analyzed the data; drafted the manuscript for intellectual content
Sharon Thomson	Wake Forest Baptist Health, Winston Salem	Major role in the acquisition of data; analyzed the data; drafted the manuscript for intellectual content
Lauren Strauss	Wake Forest Baptist Health, Winston Salem	Study concept or design; drafted and revised the manuscript for intellectual content
Rachel Graham	Wake Forest Baptist Health, Winston Salem	Study concept or design; drafted and revised the manuscript for intellectual content
Mustapha Ezeddine	Wake Forest Baptist Health, Winston Salem	Study concept or design; drafted and revised the manuscript for intellectual content
Kristen Dodenhoff	Wake Forest Baptist Health, Winston Salem	Major role in the acquisition of data; drafted and revised

		the manuscript for intellectual content
Alexander Ambrosini	Wake Forest Baptist Health, Winston Salem	Major role in the acquisition of data; drafted and revised the manuscript for intellectual content
Laura Daniela Smith	Wake Forest Baptist Health, Winston Salem	Major role in the acquisition of data; drafted and revised the manuscript for intellectual content
Laura Silla	Wake Forest Baptist Health, Winston Salem	Major role in the acquisition of data; drafted and revised the manuscript for intellectual content
Allysen Schreiber	Wake Forest Baptist Health, Winston Salem	Major role in the acquisition of data; drafted and revised the manuscript for intellectual content
Caroline Caraci	Wake Forest Baptist Health, Winston Salem	Major role in the acquisition of data; drafted and revised the manuscript for intellectual content
Amy Guzik	Wake Forest Baptist Health, Winston Salem	Study concept or design; drafted and revised the

		manuscript for intellectual content
Roy E. Strowd	Wake Forest Baptist Health, Winston Salem	Design and conceptualized study; analyzed the data; drafted and revised the manuscript for intellectual content

Table 1: Demographic characteristics of assenting participants and non-participants		
	Assenting Participants (n=753)	Non-participants (n=1527)
Mean Age	47.6±24.2	43.6±24.0
White/Caucasian	80%	77%
Black/African American	14%	16%
Asian	<1%	1%
Other Race	6%	6%
Race Not Specified	0.4%	<1%
Male	43%	40%
Female	56%	60%
Video Visit	41%	48%
Telephone Visit	52%	52%

Table 1: Demographic features of assenting participants (n=753) and non-participants (n=1,527).

Table 2: Quantitative feedback on patient satisfaction and recommendation for telehealth visits from a cohort of 753 patients				
Question 2: “How well did your telehealth visit (telephone or video) meet your neurology needs?”	“All of my needs were met”	“Some”	“A few”	“None”
	76.8%	16.2%	5.8%	1.2%
Question 3: “Would you want to have a neurology telehealth visit in the future?”	“Would definitely consider”	“Would consider”	“Would only consider if required”	“Would not consider”
	51.1%	25.0%	21.3%	2.5%

Table 2. Patient responses to Questions 2 & 3 of the quantitative telephone survey (n=753).

Table 3: Differences in patient satisfaction following video or telephone telehealth visit for a cohort of 753 patients			
% Agreement	Video Visits (n=308)	Telephone Visits (n=441)	P-Value
Question 2: “All of my needs were met”	77.0%	76.6%	0.930
Question 3: “Would definitely consider” a telehealth visit in the future	56.8%	45.9%	0.049

Table 3. Patient responses to Questions 2 & 3 of the quantitative telephone survey according to patient reported visit type (n=749).

Table 4. Summary of emergent qualitative themes describing patient experiences with ambulatory telehealth in neurology.

Table 5: Summary of qualitative themes describing patient experiences in ambulatory neurology telehealth stratified according to visit type								
Meta-Theme (% of Total Codes)	Video Visits (n=238)	Telephone Visits (n=306)	Sub-Theme (% of Meta-Theme)	Video Visits (n=238)	Telephone Visits (n=306)	Patient Experience (% of Sub-theme)	Video Visits (n=238)	Telephone Visits (n=306)
Attributes of a Positive Ambulatory Telehealth Visit	38%	31%	Benefits of Telehealth	36%	38%	Elimination of commute time, parking fees, lost time at work	80%	78%
						Convenience for patients with limited mobility	7%	12%
						Timely communication with physician	7%	6%
						No wait time outside of the physician office	4%	2%
						Services accessible even when out-of-state	2%	2%
			General Satisfaction	36%	36%	Positive experience with no elaboration	100%	100%
			Features that Contribute to a Positive Telehealth Experience	27%	25%	Positive physician relationship	73%	94%
						Helpful administration	15%	3%
						Adequate physical exam	12%	3%
			Patient Parameters for Future Use of Telehealth	1%	0%	Insurance must cover telehealth services to warrant future use	100%	0%
Attributes of a Negative Ambulatory Telehealth Visit	12%	15%	Specific Reasons for a Negative Experience	74%	70%	Inadequate physical exam	54%	28%
						Unanswered questions/outstanding concerns	21%	35%
						Delayed administrative tasks	4%	16%
						Negative physician interaction	11%	9%
						Billing concerns	4%	5%
						Miscommunication	0%	7%
						Inconvenient wait time	7%	0%
			Limitations of Telehealth Services	26%	30%	Unmet physical need or service	50%	44%
						Self-reported symptom limitations	50%	39%
						Communication difficulties due to hearing impairment, language barriers, and accent differences	0%	17%
COVID-19 Specific Experiences with Telehealth	17%	24%	Consideration of Telehealth in the Context of COVID-19	100%	100%	Preference for in-person services over telehealth	49%	57%
						Telehealth is a suitable alternative	29%	22%
						Preference for telehealth over in-person services	13%	7%
						Appreciation of increased safety and protection afforded by telehealth options	9%	7%
						Preference for video visits over telephone visits	0%	8%
Telehealth	12%	7%	Technical	65%	68%	System failure	73%	43%
						User unfamiliarity	23%	38%

Technology Satisfaction and Limitations			Difficulties			Indistinguishable technical glitches	4%	19%
			Technology Satisfaction	23%	16%	No issues with software set-up or internet connectivity	100%	100%
			Recommendations for Technological Infrastructure	13%	16%	Improvements for virtual telehealth framework	100%	100%

Table 5. Summary of emergent qualitative themes describing patient experiences with ambulatory telehealth in neurology according to visit type.

Table 6: Summary of qualitative themes describing patient perspectives on telehealth’s future success stratified according to visit type					
Meta-Theme (% of Total Codes)	Video Visits (n=238)	Telephone Visits (n=306)	Sub-Theme (% of Meta-Theme)	Video Visits (n=238)	Telephone Visits (n=306)
Factors Needed for Successful Implementation of Ambulatory Telehealth in Neurology	5%	8%	Patient Empowerment	93%	94%
			Enlist Social Support	0%	6%
			Increase Telehealth Accessibility	7%	0%
Recommendations for Scenarios Appropriate to Future Telehealth Visits	15%	11%	Follow-up for Established Patients	38%	33%
			Variable Use of Telehealth Based on Purpose of Visit	34%	27%
			Visits with No In-Person Services Required	14%	16%
			Non-Emergent Conditions	4%	11%
			Medication Management	0%	13%
			Challenges with Child/Adolescent Population	4%	0%
			Ease with Child/Adolescent Population	6%	0%

Table 6. Summary of emergent qualitative themes describing patient perspectives on telehealth’s future success according to visit type.

REFERENCES

- ¹ Schwamm LH, Holloway RG, Amarenco P, et al. A review of the evidence for the use of telemedicine within stroke systems of care: A scientific statement from the American heart association/American stroke association. *Stroke*. 2009;40(7):2616-2634. doi:10.1161/STROKEAHA.109.192360
- ² Powers WJ, Rabinstein AA, Ackerson T, et al. 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. *Stroke*. 2018;49(3):e46-e110. doi:10.1161/STR.0000000000000158
- ³ Adeoye O, Nystrom KV, Yavagal DR, et al. Recommendations for the Establishment of Stroke Systems of Care: A 2019 Update: A Policy Statement from the American Stroke Association. *Stroke*. 2019;50(7):e187-e210. doi:10.1161/STR.0000000000000173
- ⁴ Hatcher-Martin JM, Adams JL, Anderson ER, et al. Telemedicine in neurology: Telemedicine Work Group of the American Academy of Neurology update. *Neurology*. 2020;94(1):30-38. doi:10.1212/WNL.00000000000008708.
- ⁵ Kruse CS, Krowski N, Rodriguez B, Tran L, Vela J, Brooks M. Telehealth and patient satisfaction: A systematic review and narrative analysis. *BMJ Open*. 2017;7(8). doi:10.1136/bmjopen-2017-016242
- ⁶ Wechsler LR, Tsao JW, Levine SR, et al. Teleneurology applications: Report of the telemedicine work group of the American Academy of Neurology. *Neurology*. 2013;80(7):670-676. doi:10.1212/WNL.0B013E3182823361
- ⁷ Wechsler LR. Advantages and limitations of teleneurology. *JAMA Neurol*. 2015;72(3):349-354. doi:10.1177/1357633X15589534
- ⁸ Hassan A, Dorsey ER, Goetz CG, et al. Telemedicine Use for Movement Disorders: A Global Survey. *Telemed e-Health*. 2018;24(12):979-922. doi:10.1089/tmj.2017.0295
- ⁹ Strowd, RE, Strauss L, Graham R, et al. Rapid implementation of outpatient teleneurology in rural Appalachia: barriers and disparities. *Neurology Clinical Practice*. 2020. doi: 10.1212/CPJ.0000000000000906
- ¹⁰ Tang Y, Xing Y, Cui L, et al. Neurology practice during the COVID-19 outbreak and post-pandemic era: experiences and challenges. *European Journal of Neurology*. 2020. doi:10.1111/ene.14445
- ¹¹ Guzik AK and Switzer JA. Teleneurology is neurology. *Neurology*. 2019; 94(1). doi: 10.1212/WNL.00000000000008693
- ¹² Nelson EL, Duncan AB, Peacock G, Bui T. Telemedicine and adherence to national guidelines for ADHD evaluation: A case study. *Psychol Serv*. 2012;9(3):293-297. doi:10.1037/a0026824
- ¹³ Ray KN, Demirci JR, Bogen DL, Mehrotra A, Miller E. Optimizing telehealth strategies for subspecialty care: Recommendations from rural pediatricians. *Telemed e-Health*. 2015;21(8):622-629. Doi:10.1089/tmj.2014.0186
- ¹⁴ Lester GW and Smith SG. Listening and talking to patients. A remedy for malpractice suits? *West J Med*. 1993;158(3): 268-272.

¹⁵ Bartlett EE, Grayson M, Barker R, et al. The effects of physician communications skills on patient satisfaction; Recall, and adherence. 1984;37(9-10):755-764. doi: 10.1016/0021-9681(84)90044-4

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