



The Efficacy of Telehealth for the Treatment of Spinal Disorders: Patient-Reported Experiences During the COVID-19 Pandemic

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Abstract *Background:* The use of telehealth saw a rapid surge during the early months of the COVID-19 pandemic. There remains little data on how effectively telehealth replicates traditional office visits in the treatment of spinal disorders and how telehealth is perceived by patients with spinal disorders. *Questions/Purposes:* We sought to evaluate patient satisfaction with telehealth visits as a platform for delivering care for the treatment of spinal pathology. *Methods:* Patients undergoing a telehealth visit with providers specializing in the treatment of spinal disorders (one surgeon and two physiatrists) were provided with an anonymous, online survey. Data on patient satisfaction, effectiveness of the telehealth visit (in comparison with in-person visits), and clarity of communication were collected through 5-point Likert scales; visit characteristics and free-text responses were also collected. *Results:* Eighty-four patients responded to the survey. Their attitudes were largely positive, with an overall mean patient satisfaction score of 4.79. Patients gave high scores for clarity of communication during the visit, and for satisfaction with the formulation of treatment plans and their ability to ask questions, they gave the lowest scores to the effectiveness of telemedicine in replacing an in-person visit and ease of interface navigation.

Conclusions: The high overall patient satisfaction reported by our patients seeking care for a spinal pathology supports the growing body of evidence promoting the use of telehealth for orthopedic care. Further research is needed in a standardized telehealth examination of patients with spinal disorders.

Keywords telemedicine · telehealth · spine · COVID-19

Introduction

The telehealth industry has seen tremendous growth in the past decade, in conjunction with advances in telecommunication and social platforms. Telehealth, or telemedicine, involves the delivery of virtual healthcare via digital communication platforms. Although often thought of in the context of next-generation innovation, applications, and remote patient monitoring, telehealth has demonstrated initial utility for orthopedic consultations, follow-up care, and rehabilitation services [6, 12, 13, 22]. While early polls have demonstrated provider enthusiasm for telehealth [22], patient perspectives remain to be fully elucidated.

The COVID-19 pandemic has forced musculoskeletal care providers into a rapid adoption of telehealth practices. Pre-pandemic forecasts valued the 2025 telehealth market beyond \$64 billion [21]. However, the accuracy of these projections will depend on whether telehealth can provide the same level of patient satisfaction as traditional, in-person modes of care delivery. The current era of value-based healthcare places even more importance on quantifying and understanding patients' perception of telehealth.

Initial studies evaluating patient attitudes toward electronic delivery of musculoskeletal care have been largely positive, though a full understanding of patient satisfaction remains to be determined [11, 13, 17, 22, 23]. For example, a randomized controlled trial evaluating the utility of telehealth for post-operative care following rotator cuff repair suggested that a remote platform was safe and effective

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based on post-visit surveys [11]. However, another study reported that the use of telehealth for post-operative follow-up of total joint replacement was associated with lower levels of satisfaction compared with traditional care, although the authors acknowledged a degree of overgeneralization in evaluating this metric [13]. To our knowledge, there have been no prior studies that have surveyed patient satisfaction following telehealth clinic visits for the treatment of spinal pathology. The purpose of this study was to survey patient experiences following telehealth visits for spinal disorders at our institution.

Methods

This cross-sectional, anonymous online survey was approved by the institutional review board at our facility. All patients who underwent a spine-focused telehealth visit with one of four providers (one spine surgeon, three physiatrists) for a spine-related complaint between March 25 and May 15, 2020, were included. The telehealth visit involved the use of a videoconferencing platform (Zoom Inc., San Jose, CA, USA) that was granted emergency authorization for telehealth use during the COVID-19 pandemic. Providers were free to conduct the telehealth examination however they deemed appropriate; no guidance was given as to the type of history-taking or remote examination maneuvers employed. The survey link was sent by the provider to all adult patients (age ≥ 18 years) immediately after completion of the telehealth visit, regardless of surgical status (i.e., pre-operative, post-operative, or non-operative) or region of spine pathology. Before receiving the survey link, patients were informed that participation was completely optional and that their care would not be impacted in any way. This assurance was repeated in a statement at the beginning of the survey and accompanied by an explanation on the purpose of the study. No protected health information was collected.

The survey consisted of 14 questions designed by the investigators and based on other musculoskeletal telemedicine patient surveys [11, 13, 17] (Appendix Table 4). Multiple-choice formatting was utilized to collect information on the type of patient visit, age, gender, technical difficulties, and insurance coverage. Data on patient satisfaction, effectiveness of the telehealth visit (in comparison with in-person visits), and clarity of communication were collected through Likert scales. The final question allowed free-text responses on any aspects of care that were not captured by the telehealth visit as compared with an in-person visit.

Statistical Analysis

All statistical analyses were performed using IBM SPSS Version 25.0 (Armonk, NY, USA). Descriptive statistics were used to describe patient responses to each survey question. Participants were stratified by type of patient visit (new patient vs. follow-up/other) and age (≤ 60 vs. > 60 years old), and responses were compared. Categorical and continuous variables were compared using χ -square and

student's *t* tests, respectively. Significance was set as a type I error rate of $p < 0.05$.

Results

The survey was sent to 110 patients, and 84 patients (45 male, 39 female) completed the survey (response rate of 76%) (Table 1). The majority of survey respondents were > 60 years old ($n = 53$, 63.1%). New patient visit was the most frequent type of visit ($n = 33$, 39.3%); alternative visits included postsurgical follow-up ($n = 13$, 15.5%), follow-up after imaging ($n = 13$, 15.5%), follow-up after corticosteroid injection ($n = 13$, 15.5%), or "other" ($n = 12$, 14.3%). Fifty-one patients (60.7%) noted that the telehealth visit was covered by their insurance plan. Ten patients (11.9%) reported technical difficulties.

Patients displayed high overall satisfaction with telemedicine (Table 2); 81.0% of respondents reported that they were "extremely satisfied" (5/5) with their visit. The remaining patients reported either high (16.7%) or moderate (2.4%) levels of satisfaction. The majority of all patients noted that they were "extremely satisfied" with their treatment plan, with a mean score of 4.71 (SD = 0.55), while the remaining patients noted high (4/5, 19.5%) or moderate (4.9%) satisfaction. Patients noted high levels of satisfaction with their ability to pose questions during the telehealth interview (mean = 4.90, SD = 0.335).

In terms of effectiveness of the telehealth visits, nearly half of patients felt that the telehealth visit was "very effective" in replicating an in-person visit (48.8%), with a mean score of 4.32 (SD = 0.89). Only 1.2% of patients felt that the telehealth visit was "not at all effective" in replicating the traditional, in-person visit (Table 2).

Ease of navigation was also scored highly, with a mean score of 4.32 (SD = 0.88). Of the 84 patients, only 2.4% noted that it was "very difficult" (1/5) to navigate the telehealth visit. Similarly, patients reported overall high scores for effective communication via telehealth (i.e., the ability to clearly communicate their symptoms), with a mean score of 4.74 (SD = 0.469). Of the 57 patients who had some

Table 1 Patient and visit characteristics

	Gender	N	%
	Female	45	53.6%
	Male	39	46.4%
	Age, in years		
	<20	2	2.4%
	20–30	2	2.4%
	30–40	8	9.5%
	40–50	7	8.3%
	50–60	12	14.3%
	60–70	29	34.5%
	70+	24	28.6%
	Type of visit		
	New patient	33	39.3%
	Follow-up after having surgery	13	15.5%
	Follow-up after MRI	13	15.5%
	Follow-up after injection	13	15.5%
	Other	12	14.3%

Table 2 Survey responses for questions on patient satisfaction with communication and effectiveness of telehealth visit

Question	1	2	3	4	5	Mean	SD	Mean	Total responses
Overall, how satisfied were you with your telemedicine appointment?			2.4%	16.7%	81.0%	4.79	0.468	4.79	84
How effective was the telehealth visit as a replacement for an in-person visit?	1.2%	1.2%	10.7%	38.1%	48.8%	4.32	0.809	4.32	84
How easy was it to navigate the telehealth interface?	2.4%		13.1%	32.1%	52.4%	4.32	0.88	4.32	84
How clearly could you communicate your symptoms and relevant history using telemedicine?			1.2%	23.8%	75.0%	4.74	0.469	4.74	84
How clearly were you able to understand your X-ray, CT, or MRI results via telemedicine?*	3.5%		5.3%	28.1%	63.2%	4.47	0.889	4.47	57
How satisfied were you with the treatment plan developed during the visit?			4.9%	19.5%	75.6%	4.71	0.555	4.71	82
How satisfied were you with the ability to ask questions and receive answers?			1.2%	7.2%	91.6%	4.9	0.335	4.9	83

* Patients without imaging were instructed not to respond to this question

type of imaging results reviewed during their visit, 63.2% of respondents felt that they had a very clear understanding. Only 3.5% of patients noted that their understanding of imaging interpretation via telehealth was “not clear at all” (1/5).

Most patients (86.9%) stated that they would be likely to recommend a telehealth visit to a friend. Only one patient from the sample stated that they would not provide this recommendation; the remaining 10.7% of patients stated that they might recommend such a visit (Table 3).

Of the 84 respondents, 47 (0.56%) provided a free-text response to the question “Were there aspects of your care that were not captured by your remote telehealth visit as compared to an in-person visit?” Responses varied from simple “yes/no” to focal commentary with regard to aspects of the visit that patients felt were missing. The most common theme among responses was the lack of a physical examination component with telehealth.

Survey responses did not differ by patient age or type of visit ($p > 0.05$ for all associations) (Appendix Tables 5, 6, 7, and 8).

Discussion

We surveyed 84 patients undergoing a telehealth visit with a spinal care provider to assess their overall satisfaction, the

ease of use of telehealth, and the efficacy of the videoconferencing platform in replacing an in-person visit (Appendix Table 4). Patient responses were positive, with an overall mean patient satisfaction score of 4.79. Similarly, patients scored clarity of communication during the visit, satisfaction with formulation of treatment plans, and the ability to ask questions highly (Table 2). The lowest average scores were for the question “How effective was the telemedicine visit as a replacement for an in-person visit” (mean = 4.32) and “How easy was it to navigate the telehealth interface?” (mean = 4.32). The vast majority of patients ($n = 73$, 86.9%) noted that they would likely recommend telemedicine to a friend; only one patient responded that they would not provide this recommendation (Table 3).

This investigation was not without limitations. First, patients completing the survey presented with a variety of complaints of the cervical or lumbar spine. Therefore, we were unable to assess patient overall satisfaction with regard to any single pathology. However, we do not suspect that cervical versus lumbar pathologies would differ markedly with regard to videoconferencing platforms; outside of camera positioning for visual inspection and physical examination maneuvers, there are no inherent differences that should preclude the use of telehealth. Second, telehealth visits were conducted by a spine surgeon and physiatrists. One might expect that new patients presenting to a spine surgeon may feel more apprehensive of formulating a treatment plan involving operative intervention via a telehealth platform.

Table 3 Patient experiences with insurance and technical difficulties with telemedicine

Would you be likely to recommend a telemedicine visit to a friend?	Total responses	% Responses
Yes	73	86.9%
No	1	1.2%
Maybe	9	10.7%
Did you have any technical difficulties during your visit?	Total responses	% Responses
Yes	10	11.9%
No	73	86.9%
Was this visit covered by your insurance plan?	Total responses	% Responses
Yes	51	60.7%
No	6	7.1%
Do not know/not sure	27	32.1%

Given our sample size, we did not perform a sub-analysis of operative candidates. Finally, we were likely underpowered to detect certain associations of patient age or visit type with their experiences. For example, the mean score for effectiveness of telehealth as a replacement for in-person visits may have been significantly lower in a larger sample (new patients $n = 33$ vs. follow-up $n = 41$, $p = 0.205$).

Our findings suggested that the type of visit did not affect patients' overall satisfaction or effectiveness of the telehealth visit ($p > 0.05$ for all scores, Appendix Table 5). Few prior studies have tested whether visit context is associated with patient satisfaction. Patient attitudes toward telehealth have been increasingly positive across specialties [3, 8, 15, 18] as patients appreciate the comfort and convenience associated with videoconferencing services. Sharareh and Schwarzkopf found that patients undergoing elective total hip or knee arthroplasty preferred follow-up via telehealth as opposed to in-person visits, noting the benefits of decreased travel and wait times in the setting of decreased post-operative mobility [17]. Similarly, Good et al. found that patients receiving follow-up care for clavicular fractures preferred utilizing a web-based, videoconferencing platform (Skype Ltd. Palo Alto, CA, USA) [6]. Marsh et al. noted decreased patient satisfaction with web-based follow-up compared with in-person visits for post-operative care after total knee arthroplasty, although respondents noted no preference to type of visit [13]. Our results support the former findings, namely, that patient satisfaction for spine telehealth visits correlates largely with convenience and decreased travel times, as summarized by one respondent: "Overall, I really like telehealth visits because I can stay home, my doctor seems to have time to ask lots of questions and is really focused on my answers."

Similarly, we found that differences in age did not appear to affect patient satisfaction scores (Appendix Table 7). With the growing use of telehealth, there exists some concern that older patients may struggle to adopt to this newer, more technologically demanding modality [1]. Prior studies have suggested that technologic naivety, or "computer anxiety," may prove to be a barrier to the adoption of telehealth in the older population [1, 2]. In our study, over 10% of respondents over the age of 60 years reported technical difficulties. We do not suspect that this is an inherent issue with the platform because the majority of respondents reported no difficulties; rather, this finding is likely secondary to patient unfamiliarity with videoconferencing. For example, Gardner et al. found that patients with prior videoconferencing experience were more receptive to telehealth visits [4]. A recent telehealth experience survey similarly noted that most patients had some prior experience using video calls, though few had experience with videoconferencing within healthcare [15]. We anticipate that as smart devices and videoconferencing become increasingly ubiquitous, older patients will become more comfortable and accepting of telehealth.

Patient free-text criticism of telehealth was largely focused on the inability of the provider to perform a physical examination. This may also have accounted for the slightly less favorable responses as to whether telemedicine was as

effective as an in-person examination (Table 2). Beyond obtaining diagnostic information, the physical examination is also crucial in building appropriate patient rapport, as the "hands-on" aspect demonstrates a provider's focus and intent in delivering meaningful care [9, 19]. Even with the rapid uptake of telehealth practices during the COVID-19 pandemic, how to best perform an objective physical examination of the spine is yet to be determined. Initial arthroplasty and sports medicine studies are promising; web-based goniometry has demonstrated non-inferiority for assessment of upper and lower extremity range of motion, while shoulder function has been successfully evaluated via smartphones [5, 16].

To our knowledge, there are no validated best practices for performing remote physical examination of the spine. Iyer et al. recently published a "best practice" guideline for the physical examination of the spine [10]. Similarly, Tanaka et al. published their institution's protocol, recommending the use of common household objects to assess for isolated weakness in the upper or lower extremities [20]. However, the nuances of determining neurologic deficits secondary to spinal pathology may make such strength testing difficult. Furthermore, direct comparisons of telehealth exams to face-to-face exams are inherently problematic, given the notorious variations that exist between examiners [7, 14]. Further research will be needed to establish (1) a standardized remote examination of the spine and (2) whether the remote examination can serve as a diagnostic tool in itself (i.e., without requiring an in-person examination at some point). As spine care providers continue to adopt telehealth practices, learned methods of establishing diagnoses and treatment plans must be redefined.

In conclusion, our survey of patients undergoing a telehealth visit for spine-related complaints revealed high scores for overall satisfaction and ease of use. Patient scores and responses did not differ with regard to type of visit (new patient vs. follow-up) or age (over or under 60 years). Over three quarters of patients noted that they would be likely to recommend a telehealth visit to a friend, while patients' apprehension toward the technology was largely focused on the lack of physical examination. In light of the rapid surge in telehealth, we believe that assessing patient satisfaction and the efficacy of telehealth as a replacement for the face-to-face visit is crucial to furthering virtual healthcare practices. Our study supports the growing body of evidence that telehealth has been well received by patients receiving musculoskeletal care, and moving forward, spine care providers and patients alike should remain confident in its utility. Future research should be conducted toward the standardization of telehealth maneuvers and the accuracy of telehealth in formulating a diagnosis.

Compliance with Ethical Standards

Conflict of Interest: Karim Shafi, MD; Francis Lovecchio, MD; Katherine Fortson, BA; James Wyss, MD; Ellen Casey, MD; Joel Press, MD; Andrew Creighton, DO; Harvinder Sandhu, MD; and Sraivsh Iyer, MD declare that they have no conflicts of interest.

Human/Animal Rights: All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2013.

Informed Consent: Informed consent was waived from all patients included in this study.

Required Author Forms Disclosure forms provided by the authors are available with the online version of this article.

Appendix

Table 4 Spine telehealth patient survey

Question	
1	What type of visit did you just complete?
2	Overall, how satisfied were you with your telemedicine appointment?
3	How effective was the telehealth visit as a replacement for an in-person visit?
4	How easy was it to navigate the telehealth interface?
5	How clearly could you communicate your symptoms and relevant history using telemedicine?
6	How clearly were you able to understand your X-ray, CT, or MRI results via telemedicine?
7	How satisfied were you with the treatment plan developed during the visit?
8	How satisfied were you with the ability to ask questions and receive answers?
9	Would you be likely to recommend a telemedicine visit to a friend?
10	Did you have any technical difficulties during your visit?
11	Was this visit covered by your insurance plan?
12	What is your age?
13	What is your gender?
14	Were there aspects of your care that were not captured by your remote telehealth visit as compared with an in-person visit?

Table 5 Comparison scores by type of visit

Question	New patients (n = 33)		Follow-up/other (n = 51)		p
	Mean	SD	Mean	SD	
Overall, how satisfied were you with your telemedicine appointment?	4.76	0.502	4.8	0.448	0.660
How effective was the telehealth visit as a replacement for an in-person visit?	4.18	0.769	4.41	0.829	0.205
How easy was it to navigate the telehealth interface?	4.27	0.911	4.35	0.868	0.686
How clearly could you communicate your symptoms and relevant history using telemedicine?	4.73	0.452	4.75	0.483	0.866
How clearly were you able to understand your X-ray, CT, or MRI results via telemedicine? *	4.55	0.671	4.43	1.008	0.633
How satisfied were you with the treatment plan developed during the visit?	4.7	0.529	4.71	0.577	0.891
How satisfied were you with the ability to ask questions and receive answers?	4.85	0.442	4.94	0.24	0.226

Table 6 Comparison patient experiences with insurance and technical difficulties with telemedicine by type of visit

Question	New patients (n = 33)		Follow-up/other (n = 51)		p
	N	%	N	%	
Would you be likely to recommend a telemedicine visit to a friend?					0.241
Yes	29	87.9%	44	86.3%	
No	1	3.0%	0	0.0%	
Maybe	2	6.1%	7	13.7%	
Did you have any technical difficulties during your visit					0.574
Yes	3	9.1%	7	13.7%	
No	30	90.9%	43	84.3%	
Was this visit covered by your insurance plan?					0.221
Yes	21	63.6%	30	58.8%	
No	4	12.1%	2	3.9%	
Do not know/not sure	8	24.2%	19	37.3%	
What is your age?					0.704
< 60	13	39.4%	18	35.3%	
> 60	20	60.6%	33	64.7%	
What is your gender?					0.554
Female	19	57.6%	26	51.0%	
Male	14	42.4%	25	49.0%	

Table 7 Comparison scores by age

Question	Age < 60 (n=31)		Age >60 (n=53)		p
	Mean	SD	Mean	SD	
Overall, how satisfied were you with your telemedicine appointment?	4.84	0.454	4.75	0.477	0.43
How effective was the telehealth visit as a replacement for an in-person visit?*	4.29	0.739	4.34	0.854	0.789
How easy was it to navigate the telehealth interface?	4.39	0.919	4.28	0.863	0.604
How clearly could you communicate your symptoms and relevant history using telemedicine?	4.71	0.529	4.75	0.434	0.674
How clearly were you able to understand your X-ray, CT, or MRI results via telemedicine?*	4.25	1.39	4.56	0.594	0.238
How satisfied were you with the treatment plan developed during the visit?	4.65	0.661	4.75	0.483	0.433
How satisfied were you with the ability to ask questions and receive answers?	4.9	0.301	4.9	0.358	0.994

*Patients without imaging were instructed not to respond to this question

Table 8 Comparison patient experiences with insurance and technical difficulties with telemedicine by age

Question	Age < 60 (n = 31)		Age > 60 (n = 53)		p
	N	%	N	%	
Would you be likely to recommend a telemedicine visit to a friend?					0.463
Yes	26	83.9%	47	88.7%	
No	0	0.0%	1	1.9%	
Maybe	5	16.1%	4	7.5%	
Did you have any technical difficulties during your visit					0.652
Yes	3	9.7%	7	13.2%	
No	28	90.3%	45	84.9%	
Was this visit covered by your insurance plan?					0.640
Yes	17	54.8%	34	64.2%	
No	3	9.7%	3	5.7%	
Do not know/not sure	11	35.5%	16	30.2%	
What is your gender?					0.466
Female	15	48.4%	30	56.6%	
Male	16	51.6%	23	43.4%	

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