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Research Article

Telemedicine: A retrospective analysis on patient reported satisfaction and cost savings following orthopaedic telemedicine visits

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This study aimed to assess patient reported satisfaction and evaluations of cost savings following orthopaedic telemedicine appointments to better understand the impacts of telemedicine and its utility in the orthopaedic clinic setting. A retrospective review examined 33 patients who experienced telemedicine appointments for post-MRI or post-injection follow up with a single physician. Patient outcomes were measured by a nine item survey with the opportunity to provide additional feedback. Overall patient satisfaction ($T=9.94$, $p<0.0001$) and cost effectiveness evaluations did not significantly differ ($T=0.2685$, $p=0.79$; $T=1.11$, $p=0.28$) compared to results found in previous, similar research. The majority of patients indicated that they would use telemedicine again (87.88%) and that telemedicine saved money compared to traditional office visits (87.88%). The majority of patients also reported that telemedicine visits were just as effective and satisfactory (60.61%) or more effective and satisfactory (21.21%) compared to office visits. The six patients (18.18%) who indicated that telemedicine visits were less effective and satisfactory compared to an office visit also reported significantly lower total satisfaction scores ($T=3.56$, $p=0.0006$). Patient satisfaction likely has strong effects on the application of telemedicine in healthcare. Although patients generally reported high satisfaction with telemedicine, even in comparison to in-person visits, preference for in-person appointments may, for some patients, outweigh its benefits.

INTRODUCTION

The impacts of technological advancements in medicine serve to improve efficiency and effectiveness for both patients and healthcare providers. Telemedicine, which allows patients to experience direct, virtual clinical consultations with healthcare providers via video appointments, is reported to be cost effective (de la Torre-Díez et al. 2015), extends specialized healthcare service to rural areas (Nelson 2017), and reduces time and money spent on travel to hospitals and clinics (Jue, Spector, and Spector 2017). Objectively, these effects have a positive impact on patient care, schedule optimization and increased productivity.

Although research regarding telemedicine in orthopaedic surgery populations is limited, efforts have been made to develop secure telemedicine protocols and applications that are convenient for patients (Daruwalla, Wong, and Thambiah 2014). In a study aimed at understanding the effects of telemedicine in orthopaedic surgery procedures, researchers were not able to conclusively find evidence to suggest the effectiveness for patient rehabilitation following orthopaedic surgeries. The researchers did find

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evidence that telemedicine following specific surgical, orthopaedic procedures (i.e., total knee and hip arthroplasty) is more effective than telemedicine following surgical procedures of the upper limb (Pastora-Bernal et al. 2017).

Patient satisfaction with telemedicine is a critical factor in its effectiveness, as patients must be receptive to the intervention method in order to increase its efficacy. In one study, researchers found that patients were generally receptive to telemedicine but were more receptive when the communication was with a healthcare provider they already had a relationship with and as a follow up to previous, in-person treatment (Welch et al. 2017). Patient satisfaction research for telemedicine following orthopaedic treatment demonstrates no significant differences between satisfaction with telemedicine compared to in-person appointments, suggesting that telemedicine can be a practical alternative to office visits (Sathiyakumar et al. 2015). As telemedicine continues to become more widely utilized by physicians, it is important to understand the barriers and gaps in research. Analyzing patient satisfaction and cost savings with telemedicine will provide valuable knowledge to a rapidly emerging shift in healthcare administration (Harst Lorenz et al. 2018).

By understanding patients' satisfaction with current telemedicine practices, efforts can be made to continue to increase access to healthcare for patients. The purpose of this retrospective study was to evaluate patient satisfaction and cost savings following post-MRI or post-injection telemedicine visits in order to determine the satisfaction and cost effectiveness of this clinical method. It was hypothesized that patients would report high satisfaction in both.

METHODS

IRB exemption was granted from the local Institutional Review Board for a retrospective chart analysis. Study procedures were carried out in accordance with the ethical standards of the responsible committee on human experimentation.

Telemedicine visits were conducted via the OrthoLive (Cincinnati, OH) software program as standard of care patient visits at our institution's orthopaedic and sports medicine clinic by an orthopaedic physician (RMG). Patients who had the appropriate technology (smartphone or tablet/IPAD), were given an option to receive their follow up visit via telemedicine. Between January 2016 to September of 2018, patients who elected to have their appointments for post-MRI or post-injection follow up via telemedicine and had commercial insurance were retrospectively identified and included in the study. 120 patients were contacted via telephone interview by a member of the research team and asked to complete a nine item survey (see Appendix A) to assess patient satisfaction and cost effectiveness with the opportunity to provide additional feedback regarding their telemedicine experience.

TELEMEDICINE SOFTWARE

OrthoLive (Cincinnati, OH) is an orthopaedic based tool that is a free application (app) that can be downloaded and used on any smartphone device or tablet/IPAD. Patients are educated by the office staff and are given step by step instructions on how to use the OrthoLive program when electing to have their appointment via telemedicine. Once the patient logged in and consented to a virtual visit, they entered into a virtual waiting room until the provider opened the visit.

RESULTS

Ultimately, there was a low response rate from patients who had completed telemedicine visits. Surveys from 33 (28%) patients were collected for the study. The average patient age at the time of the telemedicine visit was 45.09±16.71 years with a range of 13-64 years. The average length of time the survey was conducted was 9 months (range; 6-16 months) after the telemedicine appointment.

Patients' satisfaction scores were calculated as the sum of items 1-5 on the survey (see Appendix A), with a lowest possible score of 5 (i.e., lowest satisfaction) and a highest possible score of 25 (i.e., highest satisfaction). The average total satisfaction score was 21.75±3.91 with a range of 9-25. When satisfaction scores were converted to percentages (average of 87.03±15.62%, range of 36-100%), results of a one sample t-test showed they were not significantly different than the average satisfaction (i.e., 86.3%) from the previous study (T=0.2685, p=0.79) (Valikodath et al. 2017).

Item 6 on the survey (see Appendix A) determined patients' cost effectiveness scores, with a lowest possible score of 1 (i.e., lowest cost effectiveness) and a highest possible score of 5 (i.e., highest cost effectiveness). The average cost effectiveness score was 4.10±1.05 with a range of 1-5. When cost effectiveness scores were converted to a percentage (average of 82.07±20.56%, range of 20-100%), results of a one sample t-test showed they were not significantly different than the average ((i.e., 86.3%) from the previous study (T=1.11, p=0.28) (Valikodath et al. 2017).

Additionally, of the 33 patients, 87.88% (n=29) indicated that they would use telemedicine again, whereas 12.12% (n=4) indicated that they would not use telemedicine again. 87.88% (n=29) indicated that their telemedicine visits saved money compared to office visits, whereas 12.12% (n=4) indicated that it did not.

Of the 33 total patients, 18.18% (n=6) indicated that their telemedicine visit was less effective and satisfactory compared to an office visit, 60.61% (n=20) indicated that their telemedicine visit was just as effective and satisfactory compared to an office visit, and 21.21% (n=7) indicated that their telemedicine visit was more effective and satisfactory compared to an office visit. In other words, 81.82% of patients rated telemedicine as just as or more effective and satisfactory compared to office visits. The six patients who reported telemedicine as less effective and satisfactory provided additional comments regarding their experiences (see Table 1).

Appendix A

	Very Poor - 1	Poor - 2	Fair - 3	Good - 4	Very Good - 5
1. How would you rank the convenience of your virtual telemedicine visit?					
2. How would you rank your comfort level with your telemedicine virtual visit?					
3. How would you rank the functionality of the telemedicine software?					
4. Overall, how would you rank your satisfaction with your telemedicine visit?					
5. Overall, how would you rank the ease of scheduling your appointment?					
6. How would you rank the cost effectiveness of your virtual telemedicine visit?					
	Yes			No	
7. Would you use telemedicine again if given the chance?					
8. Did your telemedicine visit save money (i.e. traveling costs) compared to a traditional visit?					
9. Do you think the telemedicine visit was *less effective and satisfactory* OR *just as effective and satisfactory* OR *more effective and satisfactory* than a traditional office visit?					
10. Any other comments you would like to share regarding the telemedicine visit or your overall satisfaction?					

Table 1: Additional comments by patients who rated their telemedicine appointments as less effective and satisfactory compared to office visits

Patient #	Age at time of appointment	Total satisfaction score	Patient comments
002	58	9	"Patient was hard of hearing, so experience was unclear and could not hear; did save time and money"
013	15	24	"Patient personally prefers in-person, but worked well and guessing it saved money"
024	14	20	"Patient prefers office visits because allows chance to ask more questions and be more thorough"
026	55	13	"Patient was dissatisfied due to miscommunication regarding telemedicine appointment"
028	41	21	"Patient is a doctor and thinks that telemedicine is not good for every circumstance, though can be effective"
030	62	14	"Patient was not happy because technology did not work well, but would try again knowing what to expect"

Additional comments provided by patients who rated their telemedicine appointments as less effective and satisfactory compared to office visits.

Although the average age (T=0.68, p=0.25) or cost effectiveness score (T=1.19, p=0.12) of these six patients did not significantly differ compared to patients who reported telemedicine as just as or more effective and satisfactory, they reported significantly lower total satisfaction scores (T=3.56, p=0.0006). Of these six patients, however, three indicated that the reason for their less effective and satisfactory rating was due to personal preference for in-person meetings (Table 1; total satisfaction scores for these patients were not significantly different (T=0.039, p=0.48)) and that they would use telemedicine again. The other three of the six patients who rated telemedicine as less effective and satisfactory expressed reasons other than personal preference (Table 1), reported significantly lower total satisfaction scores (T=4.21, p=0.00009), and indicated that they would not use telemedicine again.

Additional patient comments during the time of survey included that appointments were more "awkward" compared to office visits, technology problems hindered the experience, appointments were convenient, and appointments saved money and time.

DISCUSSION

As anticipated, patients in the study were highly satisfied with their telemedicine visits in terms of convenience, cost effectiveness, and accessibility. Sathiyakumar et al. report that the telemedicine group spent significantly less time away from work and less time on their visits overall. Similar

to our study, they reported convenience as one of the key determining factors of a patient's telemedicine experience. These findings are consistent with previous studies that have identified high patient satisfaction with telemedicine due to convenience, time savings, and increased access to quality healthcare (Nelson 2017; Jue, Spector, and Spector 2017; Sathiyakumar et al. 2015; Polinski et al. 2015; Valikodath et al. 2017; Wernhart, Gahbauer, and Haluza 2019).

Overall, our patients reported a high satisfaction rating. However, six patients experienced some dissatisfaction for the following reasons: one was hard of hearing, which negatively impacted their evaluation because it made the experience unclear; two experienced technology related problems that negatively impacted their experiences; and three cited personal preference for in-person visits. Similarly, patients' differing technological skill levels may serve as potential barriers in telemedicine. Assessing patients' levels of comfort with technology may serve as an indicator to screen for patients when assessing whether telemedicine is a proper fit. Müller et al. found that telemedicine patients did not report less satisfaction compared to traditional consultation, and that a similar number of patients expressed long-term satisfaction with telemedicine compared to traditional consultation (Müller, Alstadhaug, and Bekkelund 2017). While the current study makes no distinction between long and short-term follow up, some of the negative feedback and limitations cited by patients involved technological or operator difficulties. If used in a long-term fashion, it could be assumed that technical difficulties would become less frequent with each follow up. The technological barrier-to-entry of telemedicine is certainly worth addressing, but these problems may only affect patient satisfaction in the short-term.

Most patients also indicated that they would use telemedicine again and that they saved money on transportation costs. Abtahi et al. concluded that non-modifiable patient factors of age and travel distance can be used to predict patient satisfaction levels across all orthopaedic subspecialties. They report a direct relationship between age and satisfaction with telemedicine, concluding that young patients (18-29) had lower satisfaction than did patients in other age groups. Of the 6 unsatisfied patients in the current study, two were teenage patients near the age group cited by the previous study, and one had a non-modifiable patient factor of hearing loss that was specifically attributed to the patient's low satisfaction score.

These findings suggest that, although telemedicine may not be suitable alternative for every patient and in every circumstance, educating patients and accommodating patient preferences may increase satisfaction and the overall practicality of telemedicine (Welch et al. 2017; Wernhart, Gahbauer, and Haluza 2019; Agha et al. 2009). Additionally, physicians' attitudes toward utilizing technology mediums for patient visits impact the patients' experience (Abdulhai et al. 2018). Ultimately, patients should be presented the option of telemedicine whenever deemed appropriate by the physician, educated properly on the technology, and allowed to make an informed decision on utilizing telemedicine visits for their care.

Although the current study provided insight on patients' experiences with telemedicine, it included limitations that can be addressed in future studies. Despite the low response rate, the overall sample size (n=33) was reasonable, especially given that all patients received telemedicine from the same physician. Future studies should focus on a larger sample size, with multiple providers and also allow patients to complete satisfaction assessments immediately following their telemedicine appointments. This will allow patients to provide more detailed or accurate feedback regarding their experiences. Further cross-analysis of patient-specific travel distance, travel costs, education levels, time away from work, etc. compared to satisfaction could continue to provide data that allows physicians to develop specific guidelines for telemedicine usage within their practice.

CONCLUSION

Patient satisfaction with telemedicine is important to consider, especially as it likely impacts applications of telemedicine in healthcare. Although patients generally report high satisfaction, even compared to in-person visits, preference for in-person appointments may outweigh its benefits for some patients. Additional research is needed to determine other factors that impact patients' perceptions and ways in which patient satisfaction can be increased in order to better understand the future of telemedicine.

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