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Impact of postoperative telemedicine visit versus in-person visit on patient satisfaction: A randomized clinical trial

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ABSTRACT

Background: Although telemedicine use has increased dramatically during the COVID-19 pandemic and beyond, the impact of telemedicine versus in-person postoperative visits on patient satisfaction has not been studied prospectively. We hypothesized that telemedicine visits would be noninferior to in-person visits in terms of postoperative colorectal surgery patient satisfaction.

Methods: We conducted a randomized trial of consecutive adult patients undergoing transabdominal colorectal surgery from September 2020 to February 2021. Eligible participants were randomized 1:1 to either receive a telemedicine visit (Arm T) or an in-person visit (Arm I) for their first postoperative appointment. Subsequently, participants in Arm T completed a second postoperative visit in person, and participants in Arm I completed a second postoperative visit via telemedicine. All participants completed a patient satisfaction survey electronically within 24 hours after each postoperative visit. The primary endpoint was total patient satisfaction score. Secondary endpoints included patient-reported safety score, length of visit, and willingness of patients to recommend the practice to their peers. Fisher's exact test, χ^2 analysis, and Student's *t* test were used to compare outcomes.

Results: A total of 46 patients were analyzed with 23 each in Arm T and Arm I. The mean age of our study cohort was 50.6 (standard deviation 17.7) years and 52% were female. No significant differences were found between groups in terms of baseline characteristics. With respect to our primary endpoint of total satisfaction score, patient satisfaction scores in Arm T were non-inferior to those in Arm I. Similarly, there was no significant difference in satisfaction scores after the second postoperative visit when the visit types were reversed. We did not find any significant differences between groups in terms of our secondary endpoints.

Conclusion: Postoperative telemedicine visits were a safe and time-efficient option that maintained high patient satisfaction compared with in-person postoperative visits.

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Introduction

The use of telemedicine services in the United States has expanded widely in the past 2 decades. In surgical practices, telemedicine has been used to conduct new consultations and perform routine pre- and postoperative care.[1,2] Telemedicine can be especially helpful for patients in remote locations thousands of miles from the nearest medical center, saving them hours of travel, missed wages from taking off work, and hotel stays.[3] Moreover, postoperative telemedicine visits in patients undergoing elective surgery has been prospectively studied and found to free clinic time that can be used to schedule new patients.[4]

Despite its merits, several caveats have kept surgeons from universally adopting telemedicine in their practices. Concern over building rapport with patients, accurate coding, and reimbursement for services, as well as technical literacy required to navigate a telemedicine program have presented significant challenges.

Whereas telemedicine once occupied a niche market for patients living in remote areas of the country, the COVID-19 pandemic has propelled telemedicine forward into the mainstream in an unprecedented manner. As stay-at-home orders were implemented in most major US cities, telemedicine became a favorable option owing to exposure and safety concerns. In urban epicenters like New York City; one tertiary center reported >600% increase in the use of telemedicine since the onset of the pandemic.[5] A recent statewide assessment of 4,405 Michigan-based surgeons by Chao et al found that telemedicine use grew substantially across all surgical subspecialties since the onset of the pandemic.[6] Moreover,

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rate of telemedicine usage has remained elevated above prepandemic records even as in-person clinic visits resumed.[6]

In this study, we aimed to study the impact of increased telemedicine use on postoperative colorectal surgery patient satisfaction during the COVID-19 pandemic. To date, no prospective randomized trial in the United States has been conducted on the subject. The sustained use of telemedicine above prepandemic rates indicated that telemedicine could play an integral role in the care of postoperative patients beyond the pandemic period. We hypothesized that telemedicine was non-inferior to in-person postoperative visits in terms of patient satisfaction. Secondary outcomes included patient-reported sense of safety, length of visit, willingness of patients to recommend the practice to their peers, and hospital readmission as well as reoperation within 60 days postoperatively.

Methods

Patient population

All patients undergoing colorectal surgery with 2 board-certified colorectal surgeons belonging to the same practice group were screened for participation. The key inclusion criteria were patients aged ≥18 undergoing trans-abdominal major colorectal surgery with postoperative in-patient stay, and patients with a computer or mobile phone with both audio and video capabilities. Patients who required planned physical intervention during their first postoperative visit (eg, drain removal, suture or staple removal, dressing change), patients undergoing trans-anal and other minor procedures without postoperative in-patient stay were excluded.

Study design and protocol

A randomized clinical trial was performed of consecutive patients undergoing trans-abdominal colorectal surgery at an urban tertiary center during the period of September 2020 to February 2021. Eligible participants were randomized 1:1 to either receive a telemedicine visit (Arm T) or an in-person visit (Arm I) for their first postoperative appointment. Eligible patients who consented to participate were enrolled in the study on the day of hospital discharge. Randomization was performed in random blocks of 6 using a secure online program.[7] Patient demographics including age, sex, race, American Society of Anesthesiologists (ASA) class,[8] preoperative diagnosis, and distance of primary residence to clinic were collected. Patients were scheduled for their first postoperative visit 5 to 14 days after discharge. Telemedicine visits were conducted via the free Doximity smartphone application. Each participating patient received in-person and telemedicine postoperative visits from the same surgeon who performed the operation. All participants were asked to complete a 7-item patient satisfaction survey electronically within 24 hours after the postoperative visit. Each question was designed to assess patients' sense of safety, convenience, and overall satisfaction with their visit. Each question was scored 1 to 5, resulting in a maximum satisfaction score of 35 (Figure 1). To test whether patients who received an in-person visit first would be swayed in their satisfaction with telemedicine for their second visit and vice versa, each participant was scheduled for a second postoperative visit 3 weeks after the first visit that was the opposite type of their first visit (eg, patients who were scheduled for a telemedicine visit first were scheduled for an in-person appointment for their second postoperative visit). We hypothesized that patients who received an in-person visit first were not more likely to be dissatisfied with receiving a subsequent telemedicine visit and vice versa. All participants were asked to complete the same patient satisfaction survey electronically within 24 hours after their second postoperative appointment.

The primary endpoint was total patient satisfaction score for the first postoperative visit out of a maximum of 35. Secondary endpoints included patient-reported safety score out of a maximum of 5, length of visit, willingness of patients to recommend the practice to their peers out of a maximum score of 5, 60-day rate of readmission, and 60-day rate of reoperation. The study design and protocol were reviewed and approved by the Institutional Review Board and registered on Clinicaltrials.gov NCT04652674.

Statistical analysis

Using a noninferiority trial design, a total sample size of 46 patients (23 patients in each arm) was required to be 90% certain that the lower limit of a 1-sided 97.5% CI for the difference in means for total satisfaction scores between Arms T and I would be above the noninferiority limit Δ of −2, assuming a total patient satisfaction score of 35 for Arm I and SD of 2.[7] Fisher's exact test and Student's *t* test were used to compare outcomes.

Results

A total of 66 patients were assessed for eligibility, 8 of which declined to participate resulting in enrollment and randomization of 58 eligible patients (Figure 2). There were 12 protocol deviations including 5 patients excluded from analysis owing to failure to complete postvisit survey and 7 patients who were readmitted to the hospital before their first postoperative visit. A total of 46 patients were analyzed with 23 each in Arm T and Arm I (Figure 2). The mean age of our study cohort was 50.6 (SD 17.7) years and 52% were female. Inflammatory bowel disease was the most common preoperative diagnosis (n = 25, 54%), followed by malignancy (n = 11, 24%), diverticulitis (n = 4, 9%), sigmoid volvulus, colonic stricture, colovesicular fistula, incisional hernia, parastomal hernia, and colonic inertia (all n = 1, 2%). No significant differences were found between groups in terms of baseline characteristics including patients' self-rated level of familiarity with technology (Table I). With respect to our primary endpoint of total satisfaction score out of 35, mean difference in total scores between patients in Arm T versus patients in Arm I was −0.6 (97.5% CI, −1.7 to ∞), excluding the non-inferiority limit Δ of −2, and demonstrating that patient satisfaction scores in Arm T were noninferior to those in Arm I. We did not find any significant differences between groups in terms of our secondary endpoints including clinical outcomes (Table II).

To test whether patients who received an in-person visit first would be less or more satisfied with a subsequent telemedicine visit and vice versa, all 46 participants were scheduled for a second postoperative visit that was the opposite type from their first postoperative visit. Two patients were readmitted to the hospital before their second postoperative visit, and 3 patients failed to complete the patient satisfaction survey, resulting in a reduction of our cohort to 41 with 20 patients in Arm T and 21 patients in Arm I. We found that patients in both arms had similar total satisfaction scores (Arm T mean 32.6, SD 3.8 vs Arm I mean 33.7, SD 2; P = .25). The difference in total satisfaction scores for each patient was obtained by subtracting the score after the first visit from the score after the second visit. Although Arm T patients had a greater decrease in satisfaction score from their telemedicine visit to their in-person visit, the difference in scores was not significantly different between groups (Arm T mean −1.05, SD 2.9 vs Arm I mean −0.33, SD 1.8; P = .36). We did not find any significant differences between groups in terms of our secondary endpoints including clinical outcomes (Table III).

1. How safe did you feel during this visit?
☐ Very safe ☐ Somewhat safe ☐ Neutral ☐ Somewhat unsafe ☐ Very unsafe
2. How satisfied were you with your wait time before the appointment began?
☐ Very satisfied ☐ Somewhat satisfied ☐ Neutral ☐ Somewhat dissatisfied ☐ Very dissatisfied
3. How satisfied were you with the services you received during your appointment?
☐ Very satisfied ☐ Somewhat satisfied ☐ Neutral ☐ Somewhat dissatisfied ☐ Very dissatisfied
4. How well did you understand the information and instructions given to you during the visit?
☐ Very well understood ☐ Well understood ☐ Neutral ☐ Somewhat understood ☐ Poorly understood
5. How satisfied were you with the amount of time your surgeon spent with you?
☐ Very satisfied ☐ Somewhat satisfied ☐ Neutral ☐ Somewhat dissatisfied ☐ Very dissatisfied
6. How convenient was your visit?
☐ Very convenient ☐ Somewhat convenient ☐ Neutral ☐ Somewhat inconvenient ☐ Very inconvenient
7. How likely are you to recommend your surgeon to someone you know?
☐ Very likely ☐ Likely ☐ Neutral ☐ Unlikely ☐ Very unlikely
Total score _____ of 35

Figure 1. Postoperative patient satisfaction questionnaire. Each answer was rated on a scale of 1-5 with 5 being the most desirable response. Total score was calculated out of a maximum of 35.

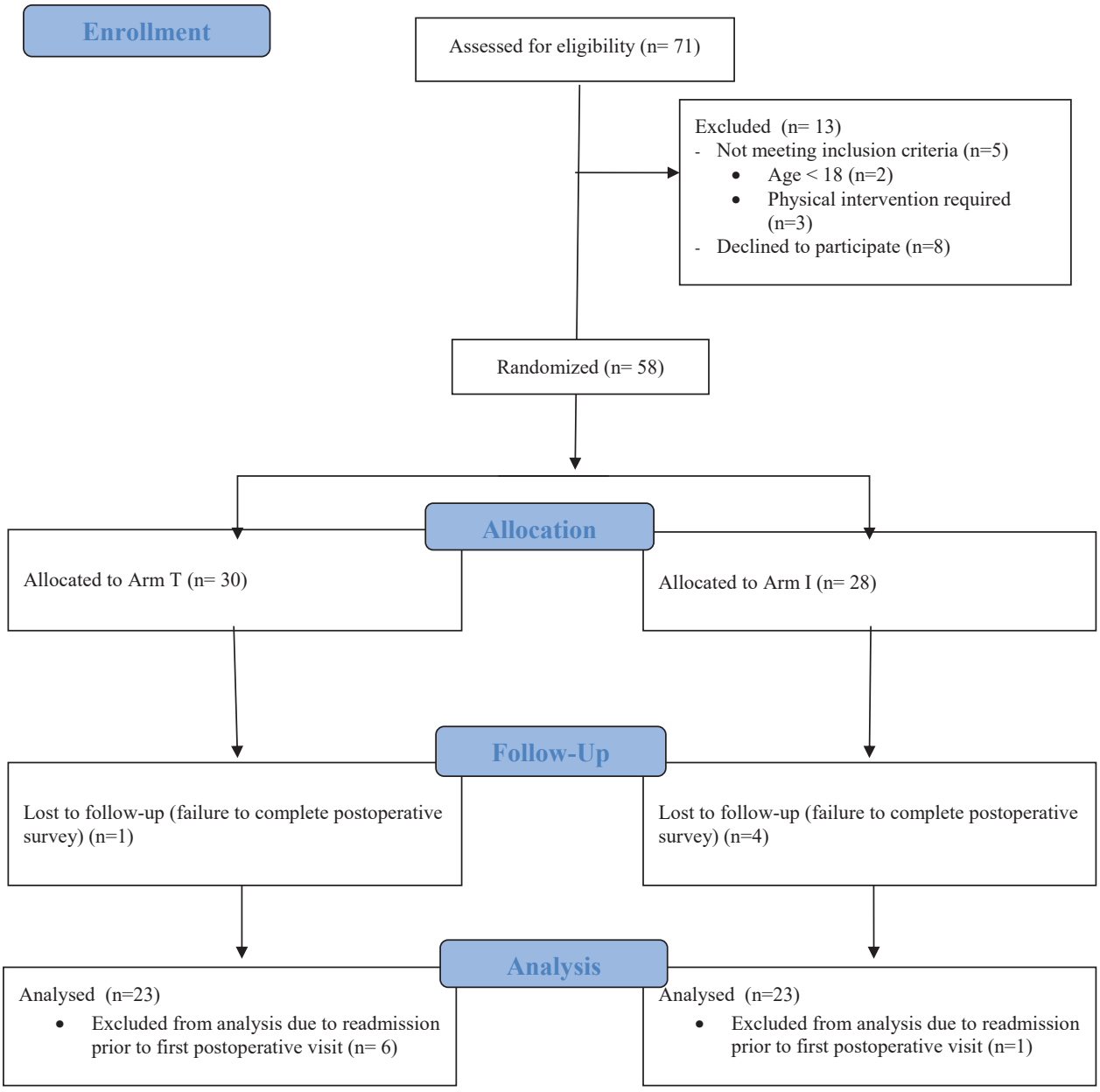

Figure 2. Consort flow diagram.

Discussion

Telemedicine was an effective tool that allowed surgeons to perform routine outpatient care to patients who resided in remote areas. Although telemedicine tools have existed for decades, surgeons have historically been hesitant to adopt the practice owing to perceived difficulty building rapport with patients, safety concerns, accurate coding, and reimbursement for services, as well as technical literacy required to navigate a telemedicine program.[9] Although these concerns were valid, pilot randomized studies in general surgery and surgical subspecialties have found that use of telemedicine for outpatient consultation and postdischarge follow-up can reduce visit time and help reduce costs for patients.[10,11] Regarding the use of telemedicine to follow postoperative patients, Viers et al found in their 2015 randomized trial of 55 patients status post radical prostatectomy that telemedicine postoperative visits could reduce patient costs and travel time while maintaining high patient and surgeon satisfaction.[12] However, all participants in this randomized study were >90 days postsurgery without ongoing surgery-related concerns. To date, no randomized trial has been conducted to systematically compare subjective or objective outcomes of telemedicine versus in-person follow-up for patients in recovery after surgery.

Despite mounting evidence of the advantages associated with telemedicine, adoption remained limited before the pandemic. The COVID-19 pandemic propelled telemedicine into mainstream practice, with many centers reporting dramatic increase in use of telemedicine across medical and surgical specialties.[5,6,13] Although telemedicine visits have been integral to patient care during the COVID-19 pandemic, we anticipate that use of the modality will remain high compared with prepandemic rates given the current trajectory.[6,13]

Our study was the only randomized trial conducted to assess postoperative patient satisfaction with telemedicine compared

Table I
Preoperative baseline characteristics

	Cohort ($n = 46$)	Arm T ($n = 23$)	Arm I ($n = 23$)	*P* value
Age	50.6 (17.7)	51 (15.7)	50.1 (19.8)	.86
Sex (female)	24 (52)	12 (52)	12 (52)	1
ASA				1
Class 1	3 (7)	1 (4)	2 (9)	
Class 2	43 (93)	22 (96)	21(91)	
Class 3	0	0	0	
Class 4	0	0	0	
Preoperative diagnosis				
IBD	25 (54)	13 (57)	12 (52)	1
Malignancy	11 (24)	4 (17)	7 (30)	.49
Diverticulitis	4 (9)	3 (13)	1 (4)	.61
Other	6 (13)	3 (13)	3 (13)	1
Days from OR to first postoperative visit	11 (4.5)	11 (2.5)	12 (5.8)	.24
Distance from patient residence to clinic (mi)	30 (37)	34 (48)	26 (20)	.49
Patient-rated familiarity with technology				1
Unfamiliar	2 (4)	1 (4)	1 (4)	
Somewhat familiar	18 (39)	9 (39)	9 (39)	
Very familiar	26 (57)	13 (57)	13 (57)	

ASA, American Society of Anesthesiologists; *IBD*, inflammatory bowel disease; *OR*, operating room.

Table II
Outcomes after the first postoperative visit

	Cohort ($n = 46$)	Arm T ($n = 23$)	Arm I ($n = 23$)	Difference of means (97.5% CI)	*P* value
Length of visit (min)	7.1 (3.9)	6.2 (3.6)	8 (4)		.11
Total satisfaction score (out of 35)	33.7 (1.9)	33.4 (2.2)	34 (1.5)	−1.7 to ∞	.016*
Safety score (out of 5)	4.9 (0.5)	4.9 (0.5)	4.9 (0.5)		1
Likelihood of recommending surgeon (out of 5)	4.9 (0.5)	4.8 (0.6)	5 (0.2)		.20
60-day hospital readmission	3 (7)	2 (9)	1 (4)		1
60-day operative reintervention	0	0	0		1

Values expressed in frequency (percentage) or mean (standard deviation). *P*-values represent t-test except **P*-value for non-inferiority.
CI, confidence interval.

Table III
Outcomes after the second postoperative visit

	Cohort ($n = 41$)	Arm T ($n = 20$)	Arm I ($n = 21$)	*P* value
Length of visit (min)	7 (5.7)	7.2 (3.8)	6.8 (7.2)	.81
Total satisfaction score (out of 35)	33.1 (3)	32.6 (3.8)	33.7 (2)	.25
Difference in total satisfaction score between first and second postoperative visit	−0.68 (2.5)	−1.05 (2.9)	−0.33 (1.8)	.36
Safety score (out of 5)	4.8 (0.6)	4.7 (0.7)	4.9 (0.3)	.26
Likelihood of recommending surgeon (out of 5)	4.9 (0.5)	4.8 (0.6)	5 (0.2)	.19

with in-person visits during the pandemic. We demonstrated that telemedicine postoperative visits were non-inferior to in-person visits with respect to patient satisfaction. Moreover, our data suggests that patients who received a telemedicine visit first then an in-person visit had a greater decrease in total satisfaction score compared with those who received an in-person visit first then a subsequent telemedicine visit (mean decrease of 1.05 compared with 0.33; Table III); however, this difference was not statistically significant. The purpose of switching the type of visit for the second postoperative appointment was to test whether patients who received an in-person visit first would be predisposed to being less satisfied with telemedicine for their second visit and vice versa. The difference in satisfaction scores was not statistically significant, which confirmed our hypothesis that patients who received an in-person visit first were not more likely to be dissatisfied with receiving a subsequent telemedicine visit. The inclusion of patients undergoing all types of major colorectal surgery, defined as transabdominal colorectal surgery requiring planned in-patient admission postoperatively, made our results more applicable and generalizable to postoperative surgical patients compared with previous trials that assessed outcomes after few specific procedures. Furthermore, receiving a telemedicine visit as the first postoperative visit was not associated with higher rates of readmission or operative re-intervention within 60 days after surgery, suggesting that telemedicine is a safe way to conduct postoperative visits (Table II). Although not statistically significant, we found that length of visit was shorter for telemedicine appointments (Tables II and III), indicating that routine use of telemedicine may save time and allow surgeons to see more patients in the allotted clinic time. Regarding concern over building rapport with patients via telemedicine, we found that there was no difference in patient-reported likelihood of recommending their surgeon to their peers (Tables II and III). Overall, these encouraging findings demonstrated that telemedicine was a noninferior option during the pandemic and suggest that it may be a safe and time-efficient tool to adopt long-term beyond the pandemic.

Several downsides to telemedicine became evident during this study and require further optimization. We found that on 3 occasions, technical difficulties with the video feature resulted in abandoning video and conducting an audio-only telemedicine visit. Lack of video did not result in adverse outcomes; however, in patients with possible wound infection or ostomy concerns, the video

component would have been crucial to diagnosis and further management. Furthermore, 3 patients over the age of 75 required family member assistance in setting up the telemedicine visit. Although their inconvenience did not result in lower satisfaction scores, it did show that telemedicine visits could represent a technological challenge for the elderly.

There were several limitations to our study. Our study excluded those patients who did not have a computer or mobile device with both video and audio capabilities. Excluding patients without these devices may introduce selection bias as patients who regularly use technology in their daily lives may be more likely to be satisfied with telemedicine visits. It should be noted that the study cohort comprised of patients who were categorized as ASA I or II, although patients categorized as ASA I-IV were eligible for enrollment. The mean age of the cohort was also relatively young at age 50.6 years. Therefore, the relatively young and predominantly healthy nature of our cohort could limit the generalizability of our results. Likewise, inflammatory bowel disease was the predominant preoperative diagnosis in our cohort, which could impact the generalizability of the study results as well. Furthermore, the conduction of our trial during the COVID-19 pandemic may have influenced patient desire to participate in telemedicine to maintain social distancing, which may have resulted in a more expeditious recruitment process compared with nonpandemic times. It should be noted that although it did not reach statistical significance, the mean distance from patients' primary residence to the clinic location was higher in Arm T compared with Arm I. The commute time from patients' residence to clinic was not measured; therefore, the possibility that patients in Arm T could have been more satisfied as they did not have to endure traffic could not be excluded. However, the crossover nature of the study design meant that patients in Arm T presented in-person for their second postoperative visit, and this did not negatively impact total satisfaction scores in a statistically significant manner. It should also be pointed out that as the trial was conducted during the peak of the COVID-19 pandemic, traffic patterns in the city of Los Angeles were significantly less congested compared with prepandemic times. Moreover, although patient satisfaction was extensively studied, physician satisfaction was not a factor in our study. Anecdotally, technical difficulties and inability to perform physical exams did pose challenges for the participating physicians.

In conclusion, postoperative telemedicine visits were a safe, time-efficient option that maintained high patient satisfaction during the COVID-19 pandemic. Even as in-person clinic visits resume, telemedicine may play a more prominent role in the care of uncomplicated postoperative patients compared with prepandemic times.

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Conflict of interest/Disclosure

Drs Phillip Fleshner and Karen Zaghiyan are consultants for Takeda Pharmaceutical Company Limited. Dr Karen Zaghiyan is a speaker for Natera Incorporated. The remaining authors have no conflicts of interests or disclosures to report.

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