

# Disruptions in Standard Care in Patients After Arthroscopic Rotator Cuff Repair During the COVID-19 Pandemic

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**Background:** The coronavirus disease–2019 (COVID-19) pandemic led to disruptions in care for orthopaedic patients who underwent surgery just before the outbreak, rendering some unable to participate in standard postoperative care. Many of these patients underwent clinical follow-up and physical therapy via telehealth.

**Purpose:** To evaluate the methods of postoperative care in patients who underwent arthroscopic rotator cuff repair (RCR) and had follow-ups during the height of the pandemic versus those who received prior standard of care. We aimed to compare the 1-year outcomes between these cohorts.

**Study Design:** Cohort study; Level of evidence, 3.

**Methods:** A retrospective chart review was used to identify patients who underwent primary RCR in February and March 2020 (COVID cohort) and the same period in 2019 (control cohort) at a single institution. Excluded were patients who underwent revision RCR, used workers' compensation, or were incarcerated or deceased. The included patients reported the postoperative care received, their satisfaction with care, physical therapy appointment type (in person, home based, telehealth, or self-guided), satisfaction with physical therapy, and minimum 1-year postoperative American Shoulder and Elbow Surgeons (ASES), Single Assessment Numeric Evaluation (SANE), and Penn Shoulder Score (PSS) outcomes.

**Results:** Overall, 428 patients were included for final analysis—199 in the COVID cohort and 229 controls. Follow-up data were collected for 160 patients in the COVID group (80.4%) and 169 control patients (73.8%). In the COVID group, 110 patients (68.8%) had  $\geq 1$  clinical visit conducted via telehealth, compared with zero in the control group. There were no differences between the COVID and control groups in the ASES ( $84.2 \pm 16.5$  vs  $86.5 \pm 17$ ;  $P = .27$ ), SANE ( $83.9 \pm 15.4$  vs  $84.8 \pm 17.5$ ;  $P = .66$ ), PSS ( $84.8 \pm 15.3$  vs  $87.1 \pm 15.1$ ;  $P = .22$ ), or patient satisfaction with the care received ( $81.7 \pm 22.6$  vs  $86.3 \pm 23.5$ ;  $P = .09$ ). Satisfaction with physical therapy was significantly higher in the control group ( $88.3 \pm 18.9$  vs  $81.9 \pm 22.5$ ;  $P = .01$ ).

**Conclusion:** Despite disruptions in care, RCR patients had comparable 1-year outcomes during the pandemic versus before the pandemic. Telehealth clinical follow-up appointments did not adversely affect patient-reported outcome measures and may be appropriate for RCR patients beyond the pandemic.

**Keywords:** physical therapy; rotator cuff repair; shoulder; telehealth; telemedicine

Rotator cuff repair (RCR) is a common orthopaedic procedure performed in the United States, with an estimated 275,000 cases performed annually and with increasing frequency.<sup>6,9</sup> Surgical repair of a torn rotator cuff can improve the quality of life for patients and create societal economic savings.<sup>16</sup> After RCR, there is an intensive follow-up and rehabilitation process.<sup>29</sup> While rehabilitation protocols can vary, close communication between the patient, surgeon, and physical therapist is important in achieving optimal outcomes after surgery.<sup>18</sup> However, much of this process was

disrupted by the coronavirus disease–2019 (COVID-19) outbreak, which was officially declared a pandemic by the World Health Organization on March 11, 2020.

National and regional shutdowns led to restrictions on outpatient services in the United States.<sup>27</sup> These gaps in patient care necessitated rapid adjustments, one of which involved shifting aspects of orthopaedic patient care to a telehealth model.<sup>20</sup> Telehealth is a method of remote care delivery utilizing modern technology.<sup>28</sup> It can improve patients' access to care and provide cost benefits, although the literature on telehealth in orthopaedic sports medicine is currently limited.<sup>31</sup> An early investigation showed that postoperative visits can be performed via telehealth after arthroscopic RCR, with no differences in patient

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satisfaction.<sup>11</sup> Similar results have been seen after arthroscopic knee surgery.<sup>7</sup> While these studies demonstrated patient satisfaction with this method of postoperative care, they did not examine any impacts on functional outcomes.

Patients who underwent elective surgical procedures immediately preceding the pandemic were presented with a unique set of circumstances. An entire cohort of patients chose to undergo surgery with the expectation of standard care; however, these expectations were subject to deviations from the established protocols. Although limited by low follow-up rates, a small study with 14 arthroscopic RCR patients affected by the pandemic showed no differences in patient outcomes with the implementation of telehealth appointments.<sup>26</sup>

To our knowledge, little is known about the methods of postoperative clinical care and physical therapy used by arthroscopic RCR patients during the pandemic. In this comprehensive study, we analyzed the short- to intermediate-term outcomes of RCR patients in this unique situation who had telehealth therapy as a part of their care plan. We hypothesized that there would be no difference in functional outcomes or patient satisfaction between these patients and patients who underwent postoperative care before the pandemic.

## METHODS

### Study Population

Institutional review board approval was received for the study protocol and all patients provided informed consent. This was a retrospective study of patients who underwent primary arthroscopic RCR in February or March 2019 and 2020. All patients underwent surgery by 1 of 26 fellowship-trained orthopaedic surgeons (including F.P.T.) at our institution, located in the northeastern United States. Patients were excluded if they had undergone revision RCR, used workers' compensation, or were incarcerated or deceased. Patients who underwent surgery between February 1 and March 31, 2020, were considered to be the COVID cohort, while those who underwent surgery between February 1 and March 31, 2019, were considered the control cohort.

### Data Collection

As some orthopaedic surgeons at our institution routinely collect preoperative American Shoulder and Elbow Surgeons (ASES) shoulder score and Single Assessment Numeric Evaluation (SANE) surveys, these preoperative patient-reported outcome measures (PROMs) were collected for the study patients, if available. Regarding

postoperative outcomes, the study patients were contacted by research team members (D.L., B.G., A.J.L., R.W.P.) who played no role in the patient care and were asked to complete the ASES, SANE, and Penn Shoulder Score (a 100-point scale that consists of 3 subscales, including pain, satisfaction, and function). In addition, patients completed a custom survey regarding postoperative care and reported any subsequent procedures on the operative shoulder. The custom survey asked patients for the method and timing of each postoperative appointment, the number and type of physical therapy appointments attended, and overall satisfaction with postoperative care and physical therapy, assessed using a 100-point visual analog scale (VAS), with higher scores indicating greater satisfaction. Patients were not asked to complete the clinical score surveys if they had undergone subsequent shoulder procedures or had complications. All surveys were collected at a minimum 1 year postoperatively. All patients were contacted via telephone, mail, or email, with any further contact via both mail and email as needed, between February 1 and April 15, 2021.

A retrospective chart review was performed to identify demographic characteristics (age, body mass index [BMI], and sex). This review was used to verify primary surgery, identify tear size and any concomitant procedures, and corroborate patient-reported postoperative clinic appointments and follow-up shoulder procedures. Clinic appointments, which occurred with either the orthopaedic surgeon or their physician assistant (including F.P.T.), were classified into specific time categories: 2 weeks ( $\pm 1$  week), 6 weeks ( $\pm 2$  weeks), 3 months ( $\pm 3$  weeks), 6 months ( $\pm 1$  month), 9 months ( $\pm 1$  month), and 12 months ( $\pm 1$  month). The visits were recorded as "office" or "telehealth"; if both types of visits occurred in the same time frame, they were logged as office. Telehealth clinic visits occurred via a standardized video interface system embedded in our institution's electronic medical record. If a visit did not fall into one of these categories, it was logged in the later applicable time point. Patients who did not attend appointments in a certain period but attended later were differentiated from those who permanently discontinued the follow-up.

Physical therapy telehealth appointments occurred outside of our institution's systems, across numerous physical therapy practices; physical therapy appointment type was reliant on patient self-reporting via the survey and was categorized as "in person," "home based" (where the physical therapist visited the patient), telehealth, or "self-guided" (ie, unsupervised).

### Statistical Analysis

The chi-square and *t* tests were utilized for the appropriate categorical and continuous variables. Surveys with

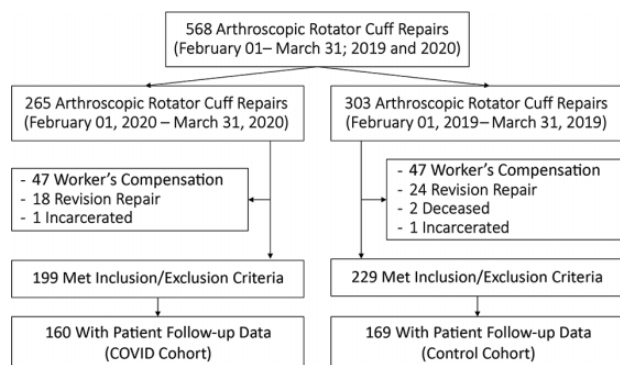
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Ethical approval for this study was obtained from Thomas Jefferson University (ref No. 20D.1208).



**Figure 1.** CONSORT (Consolidated Standards of Reporting Trials) diagram of patient enrollment. COVID, coronavirus disease.

incomplete answers were not included in the analysis. To maintain comparability between groups, the analysis of follow-up procedures only considered procedures that were performed within 1 year of the original surgical date. These values were used to supplement the statistical analysis of outcomes between groups. Because we were interested in the quality of the telehealth-related clinical and physical therapy and self-guided appointments, we also conducted a subgroup analysis comparing postoperative PROM and satisfaction scores between the patients in the COVID group with these appointment types and the overall scores of the control cohort. All statistical analyses were performed with SPSS (Version 27.0; IBM), and statistical significance was set at  $P < .05$ .

## RESULTS

### Study Population

Overall, 568 patients who underwent arthroscopic RCR during the study period were identified. Of these patients, 428 qualified for inclusion, including 199 in 2020 (COVID cohort) and 229 in 2019 (control cohort). Follow-up data were collected for 160 patients (80.4%) in the COVID group and 169 patients (73.8%) in the control group (Figure 1). The COVID cohort had a mean age of  $59.8 \pm 9.2$  years, had a mean BMI of  $29.6 \pm 5.8$ , and consisted of 88 men and 72 women. The control cohort had a mean age of  $59.8 \pm 8.6$  years, had a mean BMI of  $29.3 \pm 5.5$ , and consisted of 108 men and 61 women. The 2 cohorts did not significantly differ in age, BMI, sex, laterality, or tear size (Table 1).

### Postoperative Clinic Appointments

In the COVID cohort, 110 patients (68.8%) of 160 had  $\geq 1$  visit conducted via telehealth. Compared with zero telehealth visits in the control cohort, 2 two-week, 72 six-week, 71 three-month, and 4 six-month postoperative appointments were conducted via telehealth in the COVID cohort (Figure 2, A and B; and Table 2). A total of 23 patients in the

**TABLE 1**  
Patient and Injury Characteristics<sup>a</sup>

Variable	Control Cohort (n = 169)	COVID Cohort (n = 160)
Sex, male/female	108/61	88/72
Age, y	$59.8 \pm 8.6$	$59.8 \pm 9.2$
BMI	$29.3 \pm 5.5$	$29.6 \pm 5.8$
Laterality, left/right	60/109	62/98
Tear type		
Partial thickness	35	29
Full thickness	110	112
Massive	24	19
Follow-up procedures/complications	9	9

<sup>a</sup>Data are reported as No. of patients or mean  $\pm$  SD. BMI, body mass index; COVID, coronavirus disease.

COVID cohort had a follow-up appointment beyond the 6-month check, compared with 24 control patients.

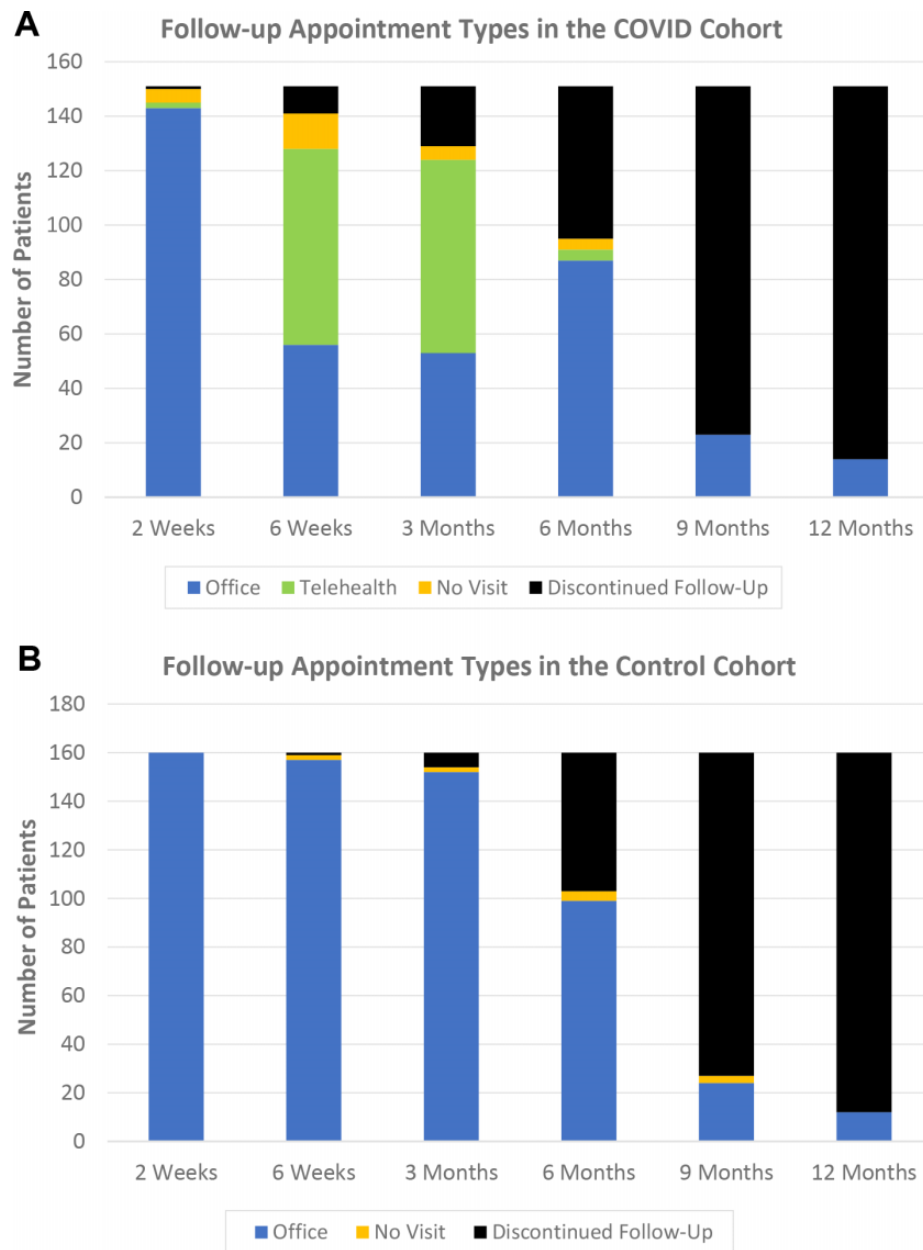
### Postoperative Physical Therapy

Overall, 151 patients in the COVID cohort and 160 patients in the control cohort had  $\geq 2$  sessions of formal, supervised physical therapy. In the COVID cohort, patients attended on average 1.5 physical therapy sessions per week in the first 3 months after surgery and 1.4 physical therapy sessions per week after 3 months and continued physical therapy for 3.4 months after surgery. This compares with 2.3 sessions per week in the first 3 months ( $P < .001$ ), 1.3 after 3 months ( $P = .40$ ), and 4.2 months of physical therapy after surgery ( $P$  sessions per week .03) in the control cohort (Table 3).

Table 3 also shows the different physical therapy appointment types for each study cohort. A large number of patients in the COVID group had their physical therapy affected by the pandemic. Out of 151 patients, 17 patients had their first physical therapy session via telehealth (11.3%), 21 had self-guided physical therapy (13.9%), and 1 patient had home-based physical therapy. All other patients had traditional in-person physical therapy. In subsequent appointments, 17 patients had telehealth physical therapy (11.3%), 58 had self-guided physical therapy (38.4%), and 2 had home-based physical therapy. In the COVID group, 18 patients (11.9%) had exclusively self-guided physical therapy and 7 patients (4.6%) had exclusively telehealth physical therapy, compared with zero patients in the control group for both variables.

### Clinical Outcomes and Follow-up Procedures

Preoperative clinical scores were available for a subset of patients—125 ASES and 123 SANE scores in the COVID group compared with 114 ASES and 114 SANE scores available for the controls. The preoperative ASES score was higher in the controls versus the COVID group ( $46.6 \pm 21.2$  vs  $37.8 \pm 25.2$ ;  $P = .003$ ). There were no significant differences between the study groups on any of the postoperative



**Figure 2.** Breakdown of follow-up clinic appointments by type for the (A) COVID and (B) control cohorts. COVID, coronavirus disease.

PROM scores (Table 4), nor were there any significant differences on any PROM score in the subgroup analysis of the COVID cohort by appointment type when compared with the overall control cohort (Table 5).

A total of 18 patients reported a follow-up procedure in the RCR shoulder within 1-year of their original day of surgery. In the COVID cohort, there were 4 capsular releases, 3 revision RCRs, 1 total shoulder replacement, and 1 irrigation and debridement due to infection. In the control group, there was 1 capsular release, 7 revision RCR, and 1 total shoulder replacement. This represented 5.6% and 5.3% of RCRs, respectively. There was no statistical difference between the 2 groups in the total number of

follow-up procedures performed ( $P = .91$ ), capsular releases ( $P = .16$ ), or revision RCRs ( $P = .25$ ) (see Table 1).

#### Patient Satisfaction

The VAS satisfaction score for patient care was not significantly different between study groups ( $P = .09$ ); however, satisfaction with physical therapy was significantly lower in the COVID cohort versus controls ( $81.9 \pm 22.5$  vs  $88.3 \pm 18.9$ ;  $P = .01$ ) (Table 4). In the subgroup analysis by appointment type, the VAS satisfaction score was significantly lower for patients in the COVID group who underwent initial self-guided physical therapy ( $69 \pm 26.5$ ;

TABLE 2  
Postoperative Clinic Appointments<sup>a</sup>

	2 Weeks	6 Weeks	3 Months	6 Months	9 Months	12 Months
Control cohort						
Office	160	157	152	99	24	12
No visit	0	2	2	4	3	0
No further follow-up	0	1	6	57	133	148
COVID cohort						
Office	143	56	53	87	23	14
Telehealth	2	72	71	4	0	0
No visit	5	13	5	4	0	0
No further follow-up	1	10	22	56	128	137

<sup>a</sup>Data is presented as numerical total. COVID, coronavirus disease.

TABLE 3  
Comparison of Physical Therapy Appointments Between Cohorts<sup>a</sup>

	Control Cohort (n = 160)	COVID Cohort (n = 151)	P
Amount of PT			
First 3 months, sessions/week	2.3 ± 0.8	1.5 ± 1.2	<.001
After 3 months, sessions/week	1.3 ± 1.2	1.4 ± 1.1	.40
Duration of PT, months after surgery	4.2 ± 3	3.4 ± 2.8	.03
Type of first PT appointment <sup>b</sup>			
In person	153	112	
Home based	3	1	
Telehealth	1	17	
Self-guided	3	21	
Types of subsequent PT appointments <sup>b</sup>			
In person	141	74	
Home based	3	2	
Telehealth	0	17	
Self-guided	16	58	
Exclusively telehealth PT <sup>b</sup>	0	7	
Exclusively self-guided PT <sup>b</sup>	0	18	

<sup>a</sup>Bold P values indicate statistically significant differences between groups (P < .05). Amount of PT is presented as mean ± SD; type of appointment is presented as numerical total. COVID, coronavirus disease; PT, physical therapy.

<sup>b</sup>P values were not collected for PT appointment type because of the small sample size of the control cohort.

P = .006), follow-up self-guided physical therapy (72.7 ± 27.4; P < .001), and exclusively self-guided physical therapy (66.24 ± 26.7; P = .004) compared with the control group (88.3 ± 18.9) (Table 5).

## DISCUSSION

The COVID-19 pandemic had a tangible and dramatic impact on patient care at our institution. It forced both

TABLE 4  
Comparison of PROM and Satisfaction Scores Between Cohorts<sup>a</sup>

	Control Cohort	COVID Cohort	P
Preoperative ASES <sup>b</sup>	46.6 ± 21.2	37.8 ± 25.2	<b>.003</b>
Preoperative SANE <sup>c</sup>	30.3 ± 24	25.2 ± 26.3	.10
ASES	86.5 ± 17	84.2 ± 16.5	.27
SANE	84.8 ± 17.5	83.9 ± 15.4	.66
PSS total	87.1 ± 15.1	84.8 ± 15.3	.22
Pain	26.1 ± 5.6	25.2 ± 5.2	.17
Satisfaction	8.1 ± 3.5	7.7 ± 2.7	.30
Function	52.9 ± 9.2	51.8 ± 9.1	.35
Satisfaction with care	86.3 ± 23.5	81.7 ± 22.6	.09
Satisfaction with PT	88.3 ± 18.9	81.9 ± 22.5	<b>.01</b>

<sup>a</sup>Bold P values indicate statistically significant differences between groups (P < .05). Values are presented as mean ± SD. ASES, American Shoulder and Elbow Surgeons; COVID, coronavirus disease; PROM, patient-reported outcome measure; PSS, Penn Shoulder Score; PT, physical therapy; SANE, Single Assessment Numeric Evaluation.

<sup>b</sup>Available for 125 COVID and 114 control patients.

<sup>c</sup>Available for 123 COVID and 114 control patients.

patients and physicians alike to adapt to the present circumstances. Nearly half of the 6-week (47.7%) and 3-month postoperative (47.0%) clinic appointments after RCR were conducted via telehealth. The majority of telehealth visits were conducted between March and June 2020, the same time as the height of the national and regional pandemic-related lockdowns. This adaptation of telehealth clinical visits is in line with what occurred nationally. A 2020 survey of 168 orthopaedic centers in the United States revealed that 88 implemented telemedicine services, with variations by geographic region.<sup>20</sup> Our physicians made a focused effort to conduct the 2-week postoperative appointment in person, with only 2 visits conducted via telehealth. A commonly cited limitation of telehealth is the absence of a thorough physical examination.<sup>30</sup> Prior investigations in orthopaedics have shown no differences in infection rates or complications with telehealth visits.<sup>7,11,23</sup> Despite this, in the postoperative context, hesitation in conducting a telehealth inspection rather than an in-person incision check is understandable to monitor for early problems (infection, etc). We report one incidence of infection in the control cohort, although none of this patient's visits were conducted via telehealth. Published rates of infection after arthroscopic RCR vary, with rates in some studies<sup>22,24</sup> ranging from 0.16% to 0.8%.

Evidence for patient satisfaction with nontraditional methods of postoperative clinical care in orthopaedics is mixed. Marsh et al<sup>15</sup> reported reduced patient satisfaction in arthroplasty patients using web-based follow-up methods. However, this study utilized an internet survey, the results of which then determined future clinical appointments. Thus, not all patients interacted with clinical staff. In contrast, Kane et al<sup>11</sup> and Herrero et al<sup>7</sup> conducted randomized trials in rotator cuff and meniscal patients using telemedicine platforms that involve visual physician-patient interactions. These studies found no differences

TABLE 5  
Subgroup Analysis of Outcomes by Postoperative Appointment Type<sup>a</sup>

	ASES		SANE		PSS		Satisfaction		
	Score	<i>P</i>	Score	<i>P</i>	Score	<i>P</i>	With Care	With PT	<i>P</i>
Control cohort (n = 229)	86.5 ± 17	—	84.8 ± 17.5	—	87.1 ± 15.1	—	86.3 ± 23.5	88.3 ± 18.9	—
COVID cohort									
Clinical telehealth (≥1 visit; n = 110)	84 ± 17.3	.28	84.2 ± 16.2	.78	83.9 ± 16.5	.14	82.1 ± 22.7		.16
Initial PT: telehealth (n = 17)	80.8 ± 17.7	.29	81.9 ± 16	.55	80.9 ± 15	.18		81.8 ± 17.4	.20
Initial PT: self-guided (n = 21)	84.4 ± 15.6	.62	81.5 ± 15.9	.42	83.6 ± 15.1	.38		69 ± 26.5	<b>.006</b>
Follow-up PT: self-guided (n = 58)	83.9 ± 17.7	.39	84.1 ± 12.8	.77	84.7 ± 15.6	.37		72.7 ± 27.4	<b>&lt;.001</b>
Exclusively telehealth PT (n = 7)	80.2 ± 17.7	.53	80.5 ± 21.6	.72	79.7 ± 7.8	.15		71.3 ± 22.1	.09
Exclusively self-guided PT (n = 18)	84.1 ± 17	.62	84.5 ± 8	.90	83 ± 15.9	.37		66.24 ± 26.7	<b>.004</b>

<sup>a</sup>Bold *P* values indicate statistically significant differences compared with the control cohort (*P* < .05). Values are presented as mean ± SD. ASES, American Shoulder and Elbow Surgeons; COVID, coronavirus disease; PSS, Penn Shoulder Score; PT, physical therapy; SANE, Single Assessment Numeric Evaluation; —, no *P* value has been assigned due to lack of comparison.

between telehealth and in-person groups in terms of satisfaction. Similarly, we reported no differences in satisfaction between our COVID and control cohorts or between the COVID telehealth patients and controls. Although patient expectations of care may have been modified during the pandemic, which can play a contributing role in satisfaction,<sup>8,19</sup> we believe that these results contribute to the growing evidence that telehealth may be a satisfactory method of conducting postoperative clinical follow-up appointments with patients.

While the impact of clinical telehealth appointments on orthopaedic postoperative satisfaction has been studied, studies into functional outcomes, particularly in RCR patients, remain limited. In their randomized controlled trial, Kane et al<sup>11</sup> reported noninferior range of motion (ROM) outcomes at 3 months in rotator cuff patients who underwent follow-up via telemedicine versus in the office. To our knowledge, the longest-term outcomes study on telemedicine in rotator cuff patients was performed by Sabbagh et al,<sup>26</sup> who reported no difference in outcomes (ASES, 12-Item Short Form Health Survey, and 3-level version of the EuroQol-5 Dimension scale) at 6-month follow-up compared with patients seen in person. The Sabbagh et al study was also conducted in the COVID-19 pandemic setting but with smaller sample sizes (28 telemedicine, 32 control patients) and a lower follow-up rate (44%) compared with the current study (n = 329 respondents; 77% follow-up rate), in which we also found no differences in PROMs between study groups.

PROMs may not fully capture postoperative stiffness, a relatively common complication after RCR. Capsular release was performed in a larger number of the COVID cohort (2.5%) patients at 1 year postoperatively than the control cohort (0.6%), albeit statistically nonsignificant. The overall rate of postoperative stiffness requiring capsular release is thought to be 3.3%.<sup>4</sup> Two of the capsular release patients in the COVID group had a telehealth appointment, while 2 did not. An indirect measure of postoperative stiffness, among other postoperative deficits, may be follow-up appointments. Follow-up after rotator cuff therapy is generally conducted out to about 6 months.

Further check-ups can be done at the physician's or patient's discretion. Also, 15% of patients had clinical appointments beyond 6 months, indicating similar levels of additional follow-up required. Based on our overall results, telehealth clinical appointments do not appear to have a negative impact on shoulder function after arthroscopic RCR.

Postoperative physical therapy was also affected by the pandemic. A total of 39 COVID cohort patients (25.8%) had their initial physical therapy in a nontraditional manner and 77 patients (51%) had subsequent nontraditional physical therapy experiences. Seven patients (5%) had exclusively telehealth physical therapy and 18 (12%) had exclusively self-guided therapy. While telerehabilitation overall has been shown to be effective in a variety of musculoskeletal conditions,<sup>3</sup> it remains understudied in rotator cuff pathology. There are some early promising results after subacromial decompression,<sup>21</sup> and some scant preliminary data available for rotator cuff tears.<sup>13,14</sup> To our knowledge, this is the first reported data on RCR patients who have had elements of formally supervised telerehabilitation. For self-guided therapy, a systematic review of level 1 and 2 evidence studies by Dickinson et al<sup>5</sup> concluded that there is some low-quality evidence to support reducing supervision in post-RCR rehabilitation if there is proper patient access to resources. Telerehabilitation could serve as a bridge for self-guided, yet formally aided, rehabilitation. Of those examined studies, the randomized trial of postoperative rehabilitation that was supervised instruction versus recorded video instruction by Roddey et al<sup>25</sup> is the most analogous to our patients who exclusively had unsupervised therapy. Despite noninferior PROM outcomes, satisfaction with unsupervised home therapy alone resulted in lower rates of patient satisfaction, while satisfaction with receiving exclusively telerehabilitation did not. The COVID cohort did report overall significant dissatisfaction with physical therapy compared with the controls, which may limit the generalizability of the subgroup analysis. Nonetheless, our results provide some limited support that both supervised telehealth physical therapy and self-guided physical therapy, through the help of physician-

provided resources, may be effective after RCR. Access to physical therapists and additional resources should still be made available to those undergoing rehabilitation.

There was a higher incidence of capsular release performed in the COVID cohort at 1 year postoperatively, although statistically nonsignificant ( $P = .16$ ). There was also a higher but statistically nonsignificant incidence of revision RCR in the control cohort at 1-year postoperative ( $P = .25$ ). While neither result was significant, this result speaks to the debate over aggressive versus conservative rehabilitation protocols after RCR. The current consensus by the American Society of Shoulder and Elbow Therapists calls for 2 weeks of strict immobilization and passive ROM at 2 to 6 weeks postoperatively.<sup>29</sup> Despite this guideline, numerous overlapping systematic reviews have been performed on this topic,<sup>1,2,12</sup> prompting reviews on the systematic reviews.<sup>10,17</sup> The overall belief appears to be that early aggressive rehabilitation, including early ROM, may result in better ROM and less adhesive capsulitis, but there is an increased risk of retear with this method. Our COVID cohort attended fewer supervised physical therapy sessions and did so for a shorter duration. It may be that when there is more self-guidance, rather than supervision by a physical therapist adhering to protocol, patients themselves are more conservative in their exercises. While we caution against using insignificant trends as evidence, this should be a consideration when patients are selecting the type and number of physical therapy sessions. Physicians should consider this in the context of patient postoperative goals and the degree of individual patients' rotator cuff pathology.

### Limitations

There are several limitations to this study. First, while almost all possible patients from a historical cohort were included, this study remains retrospective in nature. It is not a prospective, randomized controlled trial and there may be unidentified confounding factors affecting outcome measures. Our response rate exceeded 70%, but there remains the possibility of response bias in the patients who chose to respond to our queries. We did not include PROM data for patients undergoing subsequent procedures or complications and instead presented them as a single data point. We cannot control how changed patient behavior patterns and activities during the pandemic may have affected functional outcomes. Pandemic restrictions were government mandated, but as restrictions loosened over time, there may have been selection bias in the methods of care individual patients opted for. Socioeconomic data were not collected, which may have differentially affected patients' access to care and resources at home during the pandemic.

Although this study was conducted at a single institution, this represents a patient population from 3 neighboring states. Patients of 26 orthopaedic surgeons were included in this study. There is the potential for significant heterogeneity between patient populations of individual clinic sites and orthopaedic surgeons. Data collected from telerehabilitation was self-reported and unverifiable. The large number of orthopaedic surgeons included in this

study design, as well as different choices in physical therapy centers, led to varieties of rehabilitation protocols and their implementation. Last, this study only captured patient results from a specific time point—1 year postoperatively for the COVID cohort and 2 years postoperatively for the control. This introduced intergroup differences in recall bias. We cannot speak to outcomes at earlier or later time points for our COVID cohort. This may be pertinent, as the bulk of the pandemic's impact on clinic closures was during the perioperative period for these patients.

### CONCLUSION

Despite disruptions in care, RCR patients had excellent 1-year outcomes during the pandemic. Telehealth follow-up appointments and telehealth physical therapy may be appropriate as part of a mixed model of health care delivery for RCR patients beyond the pandemic and do not seem to adversely affect patient-reported functional outcomes. Patients within the COVID cohort demonstrated surgeon-related outcomes—such as overall patient satisfaction, PROMs, and resulting shoulder function—which were comparable with the control cohort. Comparably, patients within the COVID cohort also demonstrated physical therapy-related outcomes similar to the control cohort such that with physician-provided resources, both supervised telehealth physical therapy and self-guided physical therapy may be effective after RCR. Further investigations in the form of prospective, randomized controlled trials are merited.

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