



Complete Telehealth for Multidisciplinary Preoperative Workup Does Not Delay Time to Metabolic and Bariatric Surgery: a Pilot Study

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Abstract

Purpose The COVID-19 pandemic accelerated implementation of telehealth throughout the US healthcare system. At our institution, we converted a fully integrated multidisciplinary bariatric clinic from face-to-face visits to entirely telehealth video/telephone visits. We hypothesized telehealth would increase the number of provider/patient encounters and therefore delay time to surgery.

Methods This is a retrospective review of consecutive patients who underwent total telehealth preoperative workup. Demographics, comorbidities, and surgical characteristics were compared to the same number of consecutive patients who underwent a face-to-face approach 12 months prior, using a Wilcoxon test for continuous variables and chi-square or Fisher's exact test for categorical variables. Differences between time and surgery were compared using inverse probability of treatment-weighted estimates and number of preoperative visits using Poisson regression with distance to hospital as a confounder. Noninferiority margin for time to surgery was set to 60 days, and the number of visits was set to 2 visits.

Results Between March of 2020 and December of 2021, 36 patients had total telehealth workup, and were compared to 36 patients in the traditional group. Age, sex, body mass index, and comorbidities did not differ between groups. The average number of days to surgery was 121.1 days shorter in the telehealth group (90% bootstrap CI [-160.4, -81.8]). Estimated shift in the total number of visits was additional .76 visits in the traditional group (90% CI [.64, .91]).

Conclusions The total telehealth approach to preoperative bariatric multidisciplinary workup did not delay surgery and decreased number of total outpatient visits and time to surgery.

Keywords Telehealth · Bariatric surgery · Veterans Health · COVID-19

Introduction

Since the 1991 NIH Consensus Statement recommendations [1], individuals seeking bariatric surgery are typically evaluated by a multidisciplinary team of providers. However, the

COVID-19 pandemic had a broad global impact and introduced constraints and limitations on face-to-face visits [2]. Strains on healthcare systems resulted in closures of outpatient clinics and cancellation of elective surgeries [3]. This created a need to improve patient access to healthcare while also limiting unnecessary exposure for patients and providers. In response, the telehealth platform has emerged as a valuable tool for health practitioners to provide core services due to its ability to maintain continuity of patient care, limit the use of limited healthcare resources, and reach patients who are isolated or quarantined [4].

This movement towards telehealth for outpatient visits has been particularly relevant in the field of bariatric surgery, where patients often require multiple preoperative multidisciplinary evaluations to ensure candidacy and insurance coverage for surgery in a process that takes an average of 7 months [5].

Key Points

- Total telehealth preoperative workup does not delay bariatric surgery.
- Total telehealth approach does not increase required provider encounters.
- Total telehealth approach did not lead to undiagnosed preoperative conditions.

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In this study, we evaluated the effect of converting the bariatric preoperative pathway from traditional face-to-face to telehealth. We hypothesized that the lack of in-person provider evaluations would lead to a delay in time to bariatric surgery.

Methods

Study Design and Population

After institutional review board approval, we performed a retrospective single center review of all patients who underwent bariatric surgery after completing the total telehealth bariatric preoperative pathway (telehealth group). All patients were evaluated for surgical readiness and prepared for bariatric surgery by an integrated multidisciplinary team of surgeons, bariatricians, nutritionists, psychologists, and physical therapists [6]. This evaluation was converted to telehealth visits after March of 2020. All data were obtained through the electronic health record. Patient demographic data, clinical characteristics, preoperative body mass index (BMI), type and dates of surgery, and number of preoperative provider and surgeon clinic visits were obtained (Table 1). This group was compared to a cohort of an equal number of patients who underwent the traditional face-to-face preoperative bariatric pathway (traditional group). The consecutive patients in the traditional cohort underwent surgery > 1 year prior to March of 2020 to avoid confounding in patients who may have had case delays due to the COVID-19 pandemic. All patients received all care in the Veterans Health Administration.

Traditional Pathway vs Telehealth Pathway

For both groups, the pathway was initiated by the same team of multidisciplinary providers who managed the preoperative preparation of each patient up until the time of surgery. Preparedness for surgery was determined after a full medical, dietary, and psychological workup by same team of providers for each cohort. This workup was determined to be complete after the following criteria were met: the medical team optimized patient comorbidities and provided referrals to appropriate specialists when required; assessment by the psychologists determined that the patient had no active psychiatric issues or unaddressed disordered eating pathology; the dietician reviewed the pre- and postoperative dietary plans with the patient and minimized potential environmental barriers; and the physical therapist reviewed individual patient constraints to activity and designed an individualized postoperative exercise regimen. After this, a multidisciplinary group meeting was held with the surgeons to review the patients and give

final approval for surgery. There was no mandatory duration for preoperative workup or required waiting period for approval. The functioning of the face-to-face integrated multidisciplinary bariatric clinic is described elsewhere [6]. All visits for the telehealth group were completed remotely using telehealth by the same providers. A multidisciplinary video instructional seminar to help patients access informative content about bariatric surgery and the weight management program is made available to individuals interested in bariatric surgery. In addition, each individual receives an informational booklet about surgery and the program delivered by postal mail. The final preoperative visit in all cases was a face-to-face preoperative appointment with the bariatric surgeon.

Data Collection

All data was collected from the electronic health record. Data collected included demographic data (age, sex, race), address, distance of home from hospital, BMI and comorbid conditions, number and type of preoperative visits, surgery date, and surgery performed. It was also noted if the patient required any additional evaluation after surgeon preoperative visit.

Statistical Analysis

Demographics, comorbidities, and surgical characteristics were compared using a Wilcoxon test for continuous variables and a chi-square or Fisher's exact test for categorical variables.

The differences in mean time to surgery between the telehealth group and the traditional group were compared using inverse probability of treatment-weighted (IPTW) estimates with a 90% bootstrap confidence interval (one-sided confidence interval for $\alpha = 0.05$). Distance to hospital was used as the confounder of interest in deriving weights to compute inverse probability of treatment weighting-adjusted estimates. The noninferiority margin for the difference in means was set a priori to 60 days, meaning that a telehealth approach may be considered noninferior to a traditional approach if the upper bound of the 90% confidence interval is below 60 days. This threshold was felt to be a clinically significant delay to surgery as it represents just over one quarter (28.6%) of the expected time to bariatric surgery in the published literature [5]. The difference in proportions of patients requiring additional preoperative testing was compared using IPTW-adjusted estimates and a 90% bootstrap confidence interval. The noninferiority margin was set to a difference of 8%. All bootstrap intervals were computed with 5000 samples. The total number of pre-op visits between treatment groups was compared using Poisson

Table 1 Demographics by treatment Group

Characteristic	Treatment group			p value	
	Traditional (N=36)	Telehealth (N=36)	Total (N=72)		
Age				0.752(a)	
	Mean (s.d.)	49.81 (12.28)	48.53 (10.47)	49.17 (11.35)	
	Min, Max	27, 69	31, 71	27, 71	
	Median (Q1, Q3)	51.00 (39.50, 61.50)	50.50 (37.50, 54.50)	51.00 (39.00, 56.50)	
Sex	Male	26 (72%)	21 (58%)	47 (65%)	0.216(b)
	Female	10 (28%)	15 (42%)	25 (35%)	
Distance to hospital (miles)				0.001(a)	
	Mean (s.d.)	593.17 (305.59)	324.01 (287.02)	458.59 (324.05)	
	Min, Max	48, 1,243	10, 933	10, 1,243	
	Median (Q1, Q3)	672.50 (413.00, 763.50)	170.00 (97.50, 595.50)	535.00 (139.50, 679.00)	
Distance to hospital (2 category)	Close (<=200 miles)	8 (22%)	20 (56%)	28 (39%)	0.004(b)
	Far (>200 miles)	28 (78%)	16 (44%)	44 (61%)	
Distance to hospital (3 category)	Close (<=200 miles)	8 (22%)	20 (56%)	28 (39%)	0.010(b)
	Intermediate (>200 miles—<=700 miles)	17 (47%)	12 (33%)	29 (40%)	
	Far (>700 miles)	11 (31%)	4 (11%)	15 (21%)	
BMI at intake				0.068 (a)	
	Mean (s.d.)	47.99 (7.97)	45.51 (7.59)	46.75 (7.83)	
	Min, Max	37.00, 69.60	36.20, 70.40	36.20, 70.40	
	Median (Q1, Q3)	45.00 (41.80, 53.40)	42.30 (39.95, 48.25)	45.00 (40.96, 51.85)	
BMI pre-op				0.468 (a)	
	Mean (s.d.)	47.00 (8.05)	45.82 (8.00)	46.41 (7.99)	
	Min, Max	35.70, 70.00	35.90, 71.00	35.70, 71.00	
	Median (Q1, Q3)	46.25 (40.50, 51.70)	44.25 (39.70, 49.25)	45.00 (40.25, 49.70)	
Comorbidities—behavioral health	No	6 (17%)	7 (19%)	13 (18%)	0.759 (b)
	Yes	30 (83%)	29 (81%)	59 (82%)	
Comorbidities—CAD/CHF	No	28 (78%)	34 (94%)	62 (86%)	0.085 (c)
	Yes	8 (22%)	2 (6%)	10 (14%)	
Comorbidities—DM	No	18 (50%)	26 (72%)	44 (61%)	0.053 (b)
	Yes	18 (50%)	10 (28%)	28 (39%)	
Comorbidities—GERD	No	16 (44%)	17 (47%)	33 (46%)	0.813 (b)
	Yes	20 (56%)	19 (53%)	39 (54%)	
Comorbidities—HLD	No	17 (47%)	18 (50%)	35 (49%)	0.814 (b)
	Yes	19 (53%)	18 (50%)	37 (51%)	
Comorbidities—HTN	No	15 (42%)	21 (58%)	36 (50%)	0.157 (b)
	Yes	21 (58%)	15 (42%)	36 (50%)	
Comorbidities—OSA	No	9 (25%)	11 (31%)	20 (28%)	0.599 (b)
	Yes	27 (75%)	25 (69%)	52 (72%)	

(a) Wilcoxon test—*s.d.*, standard deviation; *BMI*, body mass index; *DM*, diabetes mellitus; *HTN*, hypertension

(b) Chi-square test—*Min*, minimum; *CAD*, coronary artery disease; *GERD*, gastro-esophageal reflux disease

(c) Fisher’s exact test—*Max*, maximum; *CHF*, congestive heart failure; *HLD*, hyperlipidemia; *OSA*, obstructive sleep apnea

regression with distance to PAVA as a confounder. The noninferiority margin for the number of visits was set to 2 visits. Noninferiority margins for additional preoperative testing and the number of visits were determined

based on a discussion between our bariatric surgeons on what represented clinical significance for these values. All analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC).

Results

There were 36 patients in the telehealth group who underwent bariatric surgery and were evaluated entirely through a telehealth preoperative pathway between March 2020 and December 2021. We identified 36 consecutive patients for the traditional group who were evaluated through a traditional preoperative pathway between October 2018 and March 2019, prior to the onset of COVID-19 pandemic. Age, sex, BMI, and comorbidities were similar between groups (Table 1). The distribution of distance to the bariatric surgical center was higher in the traditional group [median (IQR): 672 (413, 763.5) miles] compared to the telehealth group [median (IQR): 170 (97.5, 595.5) miles] (Table 1).

Unadjusted outcomes by treatment are detailed in Table 2. The traditional group required on average 87.4 (90% bootstrap CI – 125.2, – 48) more days from initial evaluation to surgery than the telehealth group. In addition, the telehealth group required less visits (telehealth mean: 5.11 vs. traditional mean: 6.03) and less additional preoperative testing (telehealth: 3% of patients vs. traditional: 6% of patients).

The distribution of patient distance to hospital in the IPTW-weighted groups was balanced between treatment groups. A two-category and three-category distance to hospital variable (Table 1—close, intermediate, far) was used to derive alternative weights.

The upper limit of the confidence interval for the difference of days to surgery between the telehealth and traditional cohorts was within the pre-specified noninferiority margin of 60 days. In fact, overall, there were significantly fewer days to surgery in the telehealth group compared to the traditional group (90% bootstrap confidence interval – 121 (– 160, – 81.8) days), $p = 0.0024$ (Fig. 1).

The adjusted proportions of patients requiring additional diagnostic workup at the time of preoperative visit were lower in the telehealth group compared to the traditional group [– 3% (90% bootstrap CI: – 7%, – 2%)]. Similarly, the mean number of preoperative visits decreased by 9% in the telehealth group. When adjusted for distance to the hospital, the average number of pre-op visits decreased by 24% (IQR 9%, 36%) for the telehealth group compared to the traditional group.

Discussion

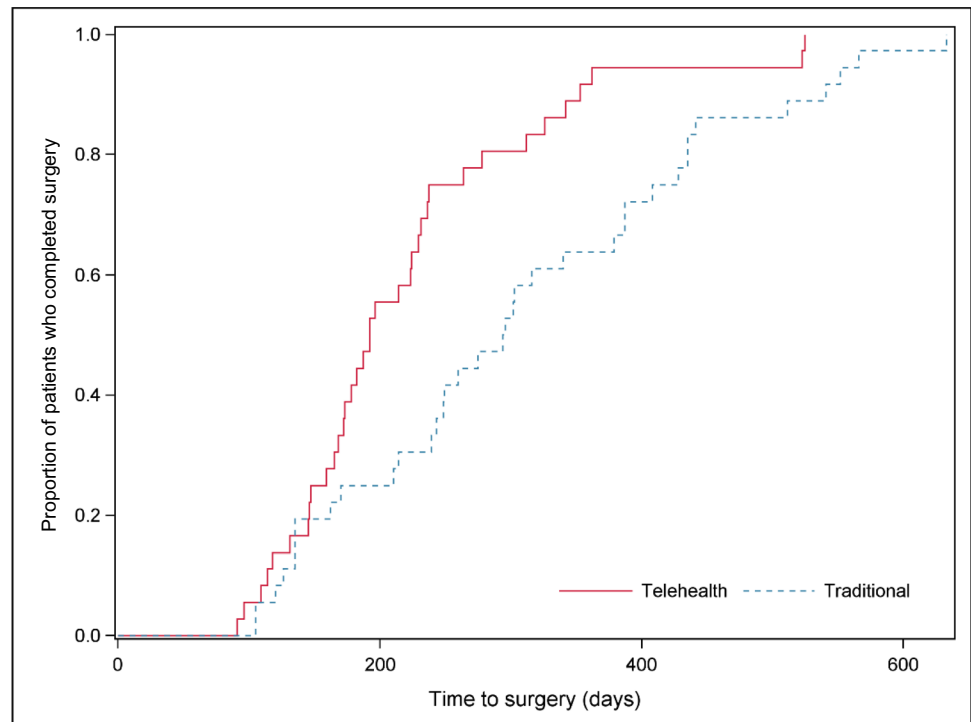
The multidisciplinary preoperative process often involves multiple visits with different health providers in preparation for bariatric surgery [1] [7]. Response to the COVID-19 pandemic limited patient access to healthcare providers/facilities and necessitated rapid action and adjustment to ensure the uninterrupted provision of healthcare to patients. Conversion of elective outpatient appointments to telehealth platforms has provided a temporizing solution to the worldwide problem of restricting provider and patient contact [8]. However, due to its recent widespread adoption, it remains to be seen if this change will be temporary or if it represents a transition in the way that healthcare will be provided in the future.

Although the utilization of telehealth has significantly increased in the setting of the COVID-19 pandemic, it was utilized as a tool prior to January 2020 as well. According to the American Medical Association's 2016 Physician Practice Benchmark Survey, 15.4% of physicians worked in practices that used telehealth for a wide spectrum of patient interactions [9]. This survey was repeated in September 2020 and demonstrated that the share of practices that utilize some form of videoconferencing to provide outpatient care was 70.3% [10].

Table 2 (Unadjusted) Outcomes by treatment

Characteristic	Treatment group			
	Traditional (N=36)	Telehealth (N=36)	Total (N=72)	
Time to Surgery (days)	Mean (s.d.)	307.92 (145.36)	220.56 (103.39)	264.24 (132.74)
	Min, Max	105, 633	91, 525	91, 633
	Median (Q1, Q3)	295 (190, 418)	192.00 (153.00, 250.50)	233.50 (163.50, 341.00)
Required additional preoperative testing?	No	34 (94%)	35 (97%)	69 (96%)
	Yes	2 (6%)	1 (3%)	3 (4%)
Number of actual pre-op visits total	Mean (s.d.)	6.03 (2.14)	5.11 (1.37)	5.57 (1.84)
	Min, Max	3, 10	3, 9	3, 10
	Median (Q1, Q3)	5 (4, 8)	5 (4, 6)	5.00 (4.00, 6.50)

Fig. 1 Time to surgery (days) by treatment group



In this study, we demonstrated that a complete transition to telehealth for the preoperative preparation of patients seeking bariatric surgery did not negatively impact time to surgery or number of visits needed to confirm surgical readiness. Studies published prior to the COVID-19 pandemic showed overall positive results with respect to efficacy of telehealth administration, patient satisfaction with the process, and the effectiveness of the education provided during telehealth appointments [11] [12] [13]. However, to our knowledge, no study has demonstrated the effect of converting all preoperative bariatric visits to telehealth approach. A recent study in patients who had bariatric surgery did show that telehealth can be a useful adjunct in the postoperative period [14].

Interestingly, our findings suggest that not only was telehealth noninferior, but also significantly decreased mean time to surgery as well as decreased average number of preoperative visits. Although smaller sample size can make generalizing this result a challenge, it demonstrates the non-inferiority of this intervention. We suspect that the decreased time to surgery in the telehealth group occurred as a function of overall convenience for the patient and the provider in scheduling appointments. This may reflect the large average travel distance to the facility, making a face-to-face clinic visit can be difficult to coordinate, requiring that patients plan further ahead, take days off from work, arranging childcare, etc.

In addition, there is evidence to suggest that transition to telehealth is well-received by the patients [15].

Using patient surveys, Lohnberg et al. demonstrated that so long as patient satisfaction and aptitude for technology are not limitations and systems are able to successfully implement a telehealth system, telehealth potentially represents the next step in the evolution of outpatient care. The advantages include improved access to care for patients in remote or underserved areas, ease of use for patients after education, limitations on exposure during the pandemic era, and potential savings for the healthcare system relating to resource utilization and provider time. These represent potential areas for future research and make telehealth an attractive option for outpatient care moving forward.

Potential limitations of this study include a small sample size; however, our statistical analysis did have adequate power to determine noninferiority of our primary outcome. In addition, while our populations were similar, the two groups had some notable differences. Specifically, the average travel distance for patients to be evaluated for bariatric surgery was 324 miles and 593 miles for the telehealth and traditional cohorts, respectively. While this represents a potential confounding factor, the individuals in each group still needed an average travel time of several hours to arrive at the bariatric center. Furthermore, we attempted to correct for this using statistical methods. In addition, this study does not report on surgical outcomes. It is unclear from these results whether short- and mid-term outcomes were affected by a fully telehealth preoperative pathway.

Conclusion

A telehealth preoperative pathway for patients seeking bariatric surgery does not result in longer time to surgery compared to the traditional preoperative pathway. The total number of preoperative visits and need for unexpected additional workup is decreased when using telehealth.

Declarations

Ethics Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study received human rights/ethical approval from the Stanford University institutional review board. For this type of study, formal consent is not required.

Informed Consent Informed consent does not apply.

This research does not reflect the views of the US Government or Veterans Affairs.

Conflict of Interest The authors declare no competing interests.

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