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Randomized pilot study of hybrid telemedicine and in-person pathways to metabolic bariatric surgery

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ABSTRACT

Objective: We investigated the viability of offering a telemedicine pathway to patients seeking metabolic bariatric surgery (MBS).
Methods: Patients were randomized to receive hybrid telemedicine (HTM, n = 21) or face-to-face (F2F, n = 22) care. Patient characteristics, program visit completion, patient satisfaction with visits, time to surgery, and insurance payor collection ratio were compared between groups.
Results: The HTM group had a higher proportion of initial medical visits completed than the F2F group (100.0% vs 72.7%). Groups did not significantly differ in patient satisfaction with visits, time to surgery, or insurance payor collection ratio. In the HTM group, 42.9% of patients underwent MBS, whereas 27.3% underwent MBS in the F2F group. Overall, 30.2% of patients elected to initiate obesity management medications, and 34.8% discontinued the program.
Conclusion: MBS programs may improve treatment access by offering an HTM pathway. Larger investigations are needed to confirm the effect of telemedicine on MBS program access.

1. Introduction

According to data from the National Health and Nutrition Examination Survey, the prevalence of severe obesity has risen from 7.7% in 2014 to 9.7% in 2023, with extreme obesity (body mass index [BMI] ≥50) increasing at the fastest rate of all BMI categories.[1,2] Metabolic bariatric surgery (MBS) has emerged as the most effective treatment option for severe obesity and reliably leads to the improvement and remission of associated medical conditions.[3,4] Obesity is defined as a BMI (calculated as weight in kilograms divided by height in meters squared) of 35 or greater, or 30 to 34.9 for people with related medical conditions.[5,6] Although the number of MBSs performed annually in the US has increased steadily over the past few decades, MBS remains an underutilized treatment for severe obesity for a variety of complex reasons.[7,8]

Barriers to MBS are broadly defined in terms of the interplay between contextual and patient determinants, such as social factors, biased beliefs about obesity, health policy decisions, and financial or organizational factors.[9,10] Financial barriers include the cost of extended travel for medical visits, time away from work, lack of affordable childcare, and lack of reliable transportation. Organizational barriers include limited hospitals available with specialty obesity care, poor connectedness of care within hospitals and outpatient clinics, and shortage of health care professionals available for bariatric care. Another barrier commonly encountered is protracted wait times for completing multiple required program visits.[11,12] Although telemedicine visits may not substantially shorten wait times, they could alleviate the burden of multiple in-person visits and potentially increase satisfaction with care during the MBS work-up.

Societal beliefs that obesity is not a chronic disease in need of treatment persist, despite that research has consistently demonstrated the biologic complexity of obesity.[13,14] Furthermore, continued beliefs that lifestyle change is the most effective treatment for severe obesity, stigmas regarding MBS itself, and misperceptions about the effectiveness of MBS are particularly harmful and negatively affect surgery completion.[15] Patient factors that are commonly barriers include living in rural communities, which increases the financial and logistical burden of

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Abbreviations

BMI	body mass index
F2F	face-to-face
HCP	health care professional
HTM	hybrid telemedicine
MBS	metabolic bariatric surgery
MBSAQIP	Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program
OMM	obesity management medication

long-distance travel; lower education level; and lower socioeconomic status. Patient misperceptions about MBS are prevalent, especially those relating to the fear of surgery, the perception that surgery is extreme, and the lack of knowledge about available treatments.[9,15,16]

Several barriers to accessing MBS can be addressed by the use of telemedicine, which is a subset of telehealth that involves direct patient care delivered remotely by health care professionals (HCPs). With its scalability, telemedicine is a promising avenue for increasing access to MBS. The rapid adoption of unrestricted telemedicine services during the COVID-19 pandemic offered an unparalleled opportunity to reduce barriers and expand access for patients considering MBS. Several positive elements of unrestricted access have remained, such as the continued offering of telemedicine video visits to patients in the comfort and safety of their homes.[17] Additionally, telemedicine continues to extend to multidisciplinary teams of HCPs, requires no preexisting relationship, and approaches payment parity with in-person visits.[18] However, whether payment parity with in-person visits will continue in the US is unknown. Factors that will influence payment parity are commercial vs government payor reimbursement, billing code complexity, and congressional approval of permanent unrestricted access to telemedicine services for government payors in the US.[19,20]

To date, studies about the use of telemedicine for patients seeking MBS have been observational and retrospective. A recent observational study confirmed a high rate of telemedicine visit completion during the pandemic and high patient satisfaction with nutrition and psychology visits before MBS. However, most patients still expressed a preference for in-person physician visits.[21] Therefore, randomized trials are needed to confirm the noninferiority of telemedicine compared with in-person care.

In this pilot study, we investigated the viability of offering a hybrid telemedicine (HTM) pathway for patients seeking MBS in a real-world clinical setting. We hypothesized that patients receiving HTM care would not significantly differ with patients receiving face-to-face (F2F) care in the completion of required program visits (eg, medical, psychology, nutrition, physical therapy), patient satisfaction with visits, length of time to surgery, or the insurance payor collection ratio for HCP visits. If found to be equally effective with F2F visits, HTM could expand access to care for patients with severe obesity.

2. Methods

2.1. Participants

This study was approved by the Mayo Clinic Institutional Review Board. No patients were harmed by participating in the study. This study was registered with ClinialTrials.gov (ID NCT05678179) (https://clinicaltrials.gov/). Patients who had an upcoming scheduled medical visit with a bariatric medicine physician or an advanced practice professional at a medical center accredited by the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) between February 6, 2023, and March 27, 2024, were contacted through the patient portal and invited to participate in this study. Patients were eligible for recruitment if they had a BMI of 35 or greater listed in their referral information and had indicated they were interested in surgical treatment of obesity. For some patients, however, referral information was limited and did not clearly indicate a preference for medical or surgical treatment. Those who were interested in MBS and agreed to participate in the study signed a consent form. Baseline characteristics, including age, sex, race, ethnicity, county of residence, BMI, and obesity-related medical complications, were obtained from the electronic health record.

2.2. Study design

The study sample size was determined based on pilot study feasibility rather than on formal statistical power calculations. Before the first scheduled medical visit, patients were randomly assigned in an unblinded 1:1 fashion to either the HTM group (n = 25) or the F2F group (n = 25). The study statistician performed the randomization by using randomized blocks of 10 patients. Other study investigators did not have access to the randomization schedule or the randomized group assignment for a given patient until after randomization. Types of visits included medical, psychology, nutrition, and physical therapy, and the visits were completed via video or in person (Table 1). Patients in the HTM group were given the option of completing the required medical testing in their local community or at our hospital, in recognition that some patients lacked access to medical care and/or testing in their communities. All surgeon visits, which occurred at the end of the work-up process, were completed in person.

2.3. Data collection and outcome measures

2.3.1. Study visits

For each type of visit, data were collected regarding whether the visit was completed. If the visit was not completed, it was noted whether the visit was rescheduled or was a no-show/cancellation.

2.3.2. Surgery completion

Time from the initial medical visit to the day of surgery was calculated in days.

2.3.3. Patient satisfaction surveys

Patients were sent a 12-item satisfaction survey through the patient portal after each HCP visit and a 4-item overall program satisfaction survey after completion of the required program visits. Surveys were configured for completion on a smartphone, tablet, or computer. Each

Table 1
Schedule of required visits for pre-MBS work-up by group.

Type or purpose of visit	HTM group (n = 21)	F2F group (n = 22)
HCP visits		
Medical[a]	HTM	F2F
Nutrition	HTM	F2F
Psychology	HTM	F2F
Physical therapy	HTM	F2F
Surgery	F2F	F2F
Test or service		
EGD	Local/F2F	F2F
ECG	Local/F2F	F2F
Laboratory blood tests	Local/F2F	F2F
Resting metabolic rate	F2F	F2F
Body composition	F2F	F2F
Overnight oximetry	Local/F2F	F2F
Specialty care as needed	HTM/F2F	F2F

Abbreviations: ECG, electrocardiogram; EGD, esophagogastroduodenoscopy; F2F, face-to-face; HCP, health care professional; HTM, hybrid telemedicine; MBS, metabolic bariatric surgery.

[a] Appointment with a bariatric medicine physician or an advanced practice professional.

survey item measured the patients' level of agreement with statements related to satisfaction with the visit and was scored by using a Likert scale (ie, 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree). To analyze the data, the mean value for a given set of questions was calculated for each patient. Then, an overall median score was calculated per group for a given set of questions. The sets of questions included 4 questions regarding level of agreement about connecting with the bariatric program (eg, my appointments were easy to schedule), 8 questions regarding level of agreement about satisfaction with the HCP (eg, responded to my questions and concerns; spent enough time with me; was trustworthy, respectful, and courteous; included me in decisions about my care), and 4 questions regarding overall satisfaction with the bariatric care program and team (eg, the bariatric care team worked together in coordinating my care, included me in decisions about my care).

2.3.4. Payment parity

For patients who elected to undergo surgery, financial data were collected regarding percent payor collection ratio, charge amount, and payment amount for each HCP visit.

2.4. Statistical analyses

Participant data were stored in REDCap (Research Electronic Data Capture) hosted at Mayo Clinic and were accessed by the study statistician only. REDCap is a secure, web-based software platform designed to support data capture for research studies.[22,23] Survey data were collected by the institution's Survey Research Center using Qualtrics XM (Qualtrics LLC) and were released only to the study statistician. All analyses were performed based on the intention-to-treat principle. Continuous variables were summarized with the sample median and range. Categorical variables were summarized with the number and percentage of patients. Baseline characteristics and outcomes were compared between the HTM and F2F groups by using a Wilcoxon rank sum test (continuous and ordinal variables) or Fisher exact test (categorical variables). *P* values less than .05 were considered significant. All statistical tests were 2-sided. Statistical analyses were performed by using R statistical software (version 4.2.2).[24]

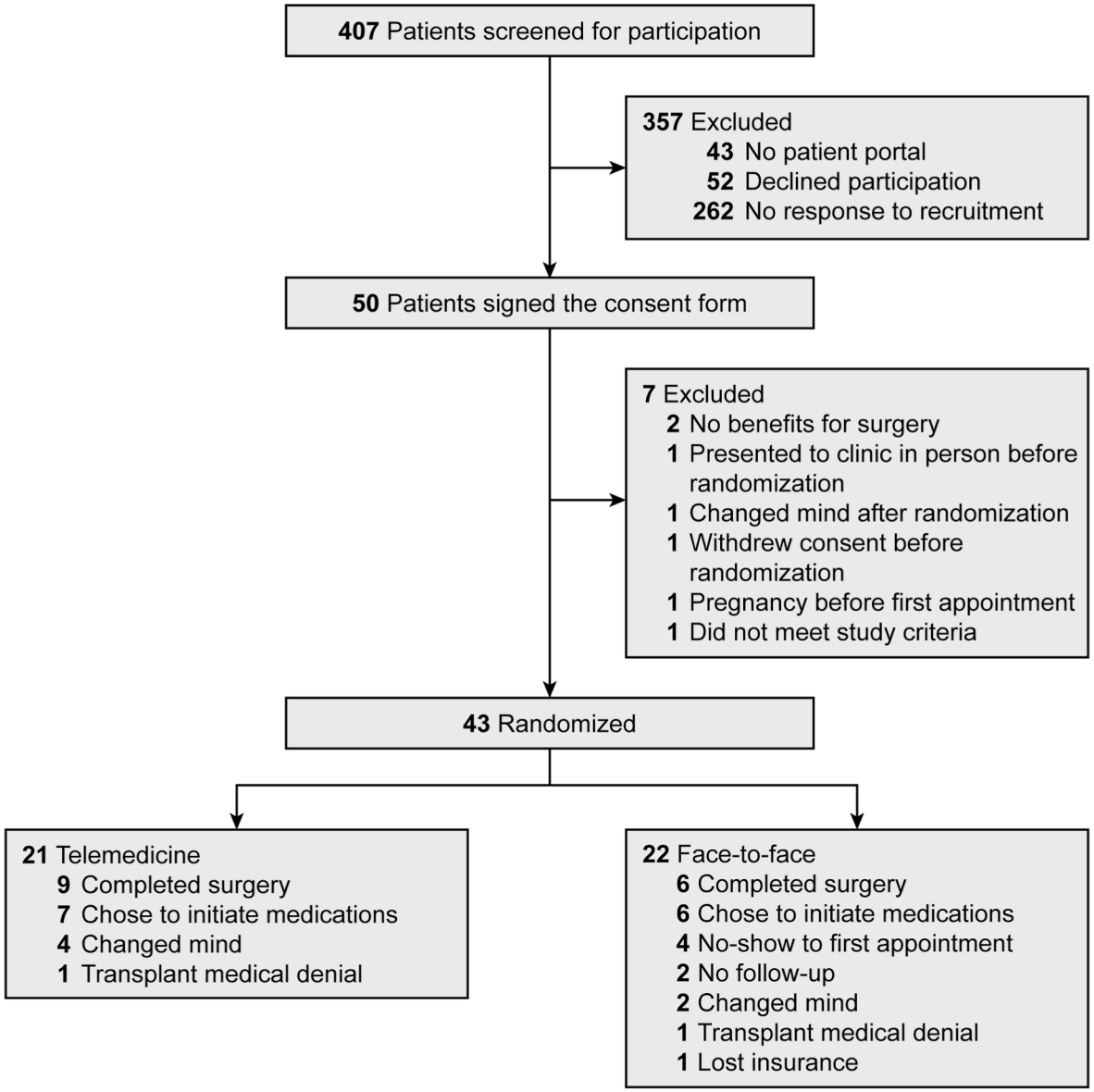

Fig. 1. Flow Diagram of Study Participation. Reasons for exclusion and attrition from the study are listed.

3. Results

3.1. Study attrition

We invited 407 consecutive patients to participate in the study. Of those, 50 patients signed the consent form and were randomly assigned to the HTM group or the F2F group. Seven participants withdrew participation after signing the consent form but before the initial medical visit, resulting in 21 patients in the HTM group and 22 patients in the F2F group. Reasons for withdrawal from the study and attrition during the study are shown in the Fig. 1.

3.2. Patient demographics

The median age in both groups was 51 years (Table 2). The median BMI was 43 in the HTM group and 46 in the F2F group. The majority of patients were White (74%, 31/42) and female (77%, n = 33), which is common among MBS patient populations in the US.[25] Study patients resided in 14 different counties in Florida. Patients from 8 of those counties had limited access to MBSAQIP centers and were required to travel outside the county for MBS.[26] No significant differences were observed between groups in baseline patient characteristics (Table 2).

3.3. Completed study visits

Appointment outcomes (ie, completed, rescheduled, or no-show/cancellation) were compared between groups according to visit type (ie, medical, psychology, nutrition, physical therapy, surgery) (Table 3). Significant differences were observed between groups for medical visits ($P = .02$) and physical therapy visits ($P = .01$). The HTM group had a higher proportion of completed medical visits (100.0% vs 72.7%) and physical therapy visits (95.0% vs 55.6%) than the F2F group. However, no significant differences were observed between groups for psychology visits ($P = .26$), nutrition visits ($P = .18$), or surgery visits ($P > .99$). Of note, surgery visits were completed in person only, regardless of group assignment.

For patients who completed a visit with a surgeon, the median time between the medical visit and the date of surgery was similar between the HTM group and the F2F group (185 days vs 192 days, respectively; $P > .99$).

Table 2
Comparison of baseline characteristics between groups[a].

Variable	HTM group (n = 21)	F2F group (n = 22)	*P* value[b]
Age, median (range), y	51 (31-70)	51 (31-77)	.87
Male sex	5 (23.8)	5 (22.7)	>.99
Race			.30
Black	7 (35.0) (n = 20)	4 (18.2)	
White	13 (65.0) (n = 20)	18 (81.8)	
Hispanic or Latino ethnicity	1 (5.0) (n = 20)	0 (0.0) (n = 21)	.49
County			.54
Duval	8 (38.1)	11 (50.0)	
Non-Duval	13 (61.9)	11 (50.0)	
BMI,[c] median (range)	43 (36-60)	46 (36-56)	.36
BMI category			.17
35.0-39.9	6 (28.6)	3 (13.6)	
40.0-44.9	7 (33.3)	7 (31.8)	
45.0-49.9	5 (23.8)	6 (27.3)	
≥50	3 (14.3)	6 (27.3)	
Secondary diagnosis			
Type 2 diabetes[13]	1 (4.8)	6 (27.3)	.10
Hypertension	9 (42.9)	14 (63.6)	.23
Sleep apnea	14 (66.7)	9 (40.9)	.13
MASLD	1 (4.8)	4 (18.2)	.34
Kidney failure	1 (4.8)	3 (13.6)	.61
Other	2 (9.5)	3 (13.6)	>.99

Abbreviations: BMI, body mass index; F2F, face-to-face; HTM, hybrid telemedicine; MALSD, metabolic dysfunction associated with steotic liver disease.
[a] Values are reported as No. (percent) unless otherwise indicated.
[b] The Wilcoxon rank sum test was used to compare continuous and ordinal variables, and the Fisher exact test was used to compare categorical variables.
[c] Calculated as weight in kilograms divided by height in meters squared.

Table 3
Comparison of appointment outcomes between groups[a].

Visit type and outcome	HTM group (n = 21)	F2F group (n = 22)	*P* value[b]
Medical visit			.02
Completed	21 (100.0)	16 (72.7)	
Rescheduled	0 (0)	3 (13.6)	
No show/cancellation	0 (0)	3 (13.6)	
Psychology visit			.26
Completed	15 (88.2) (n = 17)	10 (62.5) (n = 16)	
Rescheduled	1 (5.9) (n = 17)	2 (12.5) (n = 16)	
No show/cancellation	1 (5.9) (n = 17)	4 (25.0) (n = 16)	
Nutrition visit			.18
Completed	19 (90.5)	13 (65.0) (n = 20)	
Rescheduled	1 (4.8)	3 (15.0) (n = 20)	
No show/cancellation	1 (4.8)	4 (20.0) (n = 20)	
Physical therapy visit			.01
Completed	19 (95.0) (n = 20)	10 (55.6) (n = 18)	
Rescheduled	0 (0) (n = 20)	4 (22.2) (n = 18)	
No show/cancellation	1 (5.0) (n = 20)	4 (22.2) (n = 18)	
Surgery visit			>.99
Completed	9 (90.0) (n = 10)	6 (100.0) (n = 6)	
Rescheduled	0 (0) (n = 10)	0 (0) (n = 6)	
No show/cancellation	1 (10.0) (n = 10)	0 (0) (n = 6)	
Time from medical visit to date of surgery, median (range), d	185 (121-336) (n = 9)	192 (112-259) (n = 6)	>.99

Abbreviations: F2F, face-to-face; HTM, hybrid telemedicine.
[a] Values are reported as No. (percent) unless otherwise indicated.
[b] The Wilcoxon rank sum test was used to compare continuous and ordinal variables, and the Fisher exact test was used to compare categorical variables.

3.4. Satisfaction survey responses

Survey response rates ranged between 62.5% (10/16) and 90.5% (19/21) for the HTM group and between 64.3% (9/14) and 91.7% (11/12) for the F2F group. Survey scores were compared between groups regarding the level of agreement about connecting with the bariatric program, satisfaction with the HCP, and overall satisfaction with the bariatric program and team. No significant differences were observed in survey scores between the HTM and F2F groups (Table 4).

3.5. Insurance payor collection ratio

For the subgroup of 15 patients who underwent surgery, those in the HTM group (n = 9) had 3 Medicare and 6 commercial payors, and the F2F group (n = 6) had 2 Medicare and 4 commercial payors. We compared the percent payor collection ratio, charge amount, and payment amount for each type of visit between groups (Table 5). The median charge amount for nutrition visits was significantly lower for the HTM group than for the F2F group ($268 vs $423, respectively; $P = .02$). Although the difference was nonsignificant, the median charge amount

Table 4
Comparison of survey response scores after each type of visit[a].

Question set	HTM group (n = 21)		F2F group (n = 22)		
	n	Value	n	Value	*P* value[b]
Medical visit					
Level of agreement about connecting with the bariatric clinic	19	4.3 (3.0-5.0)	14	4.0 (1.0-5.0)	.39
Level of agreement about the care professional	19	5.0 (4.0-5.0)	14	5.0 (1.0-5.0)	.48
Psychology visit					
Level of agreement about connecting with the bariatric clinic	10	4.6 (4.0-5.0)	11	5.0 (1.0-5.0)	.39
Level of agreement about the care professional	10	5.0 (4.0-5.0)	11	5.0 (1.0-5.0)	.39
Nutrition visit					
Level of agreement about connecting with the bariatric clinic	15	5.0 (1.0-5.0)	13	5.0 (3.5-5.0)	.63
Level of agreement about the care professional	15	5.0 (1.0-5.0)	13	5.0 (4.0-5.0)	.39
Physical therapy visit					
Level of agreement about connecting with the bariatric clinic	14	4.9 (2.5-5.0)	9	5.0 (3.0-5.0)	.98
Level of agreement about the care professional	14	5.0 (3.8-5.0)	9	5.0 (4.5-5.0)	.24
Surgery visit[c]					
Level of agreement about connecting with the bariatric clinic	6	4.4 (3.3-5.0)	4	4.8 (4.5-5.0)	.31
Level of agreement about the care professional	6	5.0 (4.3-5.0)	4	5.0 (5.0-5.0)	.24
Overall program satisfaction	12	5.0 (1.0-5.0)	8	5.0 (1.0-5.0)	.79

Abbreviations: F2F, face-to-face; HTM, hybrid telemedicine.
[a] Values are reported as median (range). The mean value of the given question set was calculated for each patient. Then, an overall median score for the given question set was calculated per group. Possible responses were as follows: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.
[b] The Wilcoxon rank sum test was used to compare groups.
[c] All surgeon consults were in person, regardless of whether the patient was randomized to the HTM or F2F group.

for medical visits was lower for the HTM group than for the F2F group ($577 vs $743, respectively; $P = .08$).

4. Discussion

In this pilot study, we demonstrated the viability of offering an HTM pathway to patients seeking MBS in a real-world clinical setting. In accordance with our findings, observational research over the past 5 years has shown that telemedicine is useful for MBS appointments in multiple ways. First, telemedicine visits had a significantly lower rate of no-shows than did in-person visits in previous years.[27] Second, patients found telemedicine to be more convenient for fitting appointments into their daily schedules. This allows flexibility by avoiding travel during inclement weather and simplifying childcare arrangements, while providing the comfort and convenience of receiving care at home.[28–30] Third, patients avoided scheduling delays for telemedicine visits, which decreased the amount of time between the initial consultation and surgery and resulted in fewer preoperative appointments overall.[27,31] Increased efficiency in the work-up process may result in reduced wait times for surgery and, in turn, earlier improvements in health status and quality of life.[4] Nonetheless, with increased use of telemedicine and fewer in-person touchpoints, patient safety during the work-up process remains critical for patients with complex medical complications.[32]

Table 5
Comparison of percent payor collection ratio, charge amount, and payment amount for each visit type between groups for patients who underwent surgery (n = 15)[a].

Variable	HTM (n = 9)	F2F (n = 6)	*P* value[b]
Percent payor collection ratio by visit type			
Medical	57.6 (24.7-87.0)	71.7 (0.0-86.9)	.81
Psychology	38.4 (0.0-92.4)	44.5 (0.0-92.4)	.30
Nutrition	55.5 (0.0-100.0)	74.9 (0.0-86.3)	.63
Physical therapy	49.6 (24.3-86.2)	74.6 (0.0-86.2)	.90
Surgery	62.0 (24.1-85.3)	75.5 (18.8-88.3)	.48
Charge amount by visit type, US $			
Medical	577.0 (296.0-846.0)	743.0 (450.0-1037.0)	.08
Psychology	425.0 (425.0-448.0)	436.5 (425.0-448.0)	.28
Nutrition	268.0 (0.0-423.0)	423.0 (402.0-564.0)	.02
Physical therapy	376.0 (376.0-397.0)	386.5 (376.0-397.0)	.53
Surgery	456.0 (312.0-604.0)	543.5 (312.0-846.0)	.77
Payment amount by visit type, US $			
Medical	412.4 (76.4-735.6)	532.8 (0.0-900.7)	.41
Psychology	163.2 (0.0-392.7)	196.3 (0.0-398.6)	.95
Nutrition	166.2 (0.0-402.0)	349.4 (0.0-375.5)	.21
Physical therapy	186.5 (96.5-329.0)	293.6 (0.0-329.0)	.59
Surgery	315.7 (75.2-388.8)	235.7 (108.2-746.6)	.91

Abbreviations: F2F, face-to-face; HTM, hybrid telemedicine.
[a] Values are reported as median (range).
[b] Data were compared by using the Wilcoxon rank sum test.

In further support of telemedicine, one study showed no significant differences in registration numbers, seminar attendance rates, and surgery completion when introductory seminars for MBS were held via telemedicine or in person.[33] Likewise, another study reported no significant differences in the multidisciplinary care team decision about the appropriateness of MBS for patients who had completed the work-up process via telemedicine or in person.[34] Moreover, both patients and HCPs report high levels of satisfaction with telemedicine visits.[35,36] In a recent qualitative study, patients were interviewed about their experiences with telemedicine during the MBS work-up process and reported both positive and negative experiences with telemedicine.[36] Although they were satisfied with the convenience and accessibility of telemedicine appointments, they also had concerns about not receiving a physical examination and feeling less connected to the care team.

Consistent with our study hypothesis, we observed no significant differences between groups in the appointment outcomes of the required psychology and nutrition visits. However, significant differences were observed between groups for the appointment outcomes of medical visits (the initial program entry visit) and physical therapy visits. Specifically, a higher proportion of patients in the HTM group than the F2F group completed their medical visit and physical therapy visit. This finding suggests that offering patients a choice of a telemedicine or in-person appointment for the initial visit may be effective for increasing the initiation of program engagement. In addition, telemedicine may be a particularly effective modality for reducing rescheduled appointments, no-shows, and cancellations for patients.[27] This approach may also make it easier for patients to learn about MBS and for HCPs to address misperceptions about it without having to invest many resources initially. Telemedicine may also be effective for educating patients regarding lifestyle changes required for optimizing outcomes and attenuating risk for postoperative complications.[37] Similarly, patients may be more likely to participate in video physical therapy visits than in-person visits, which may be especially inviting for patients living with physical limitations.[38] These findings are consistent with results from a recent observational study comparing telemedicine video visits with in-person visits during the pandemic.[21] A high rate of completion was observed for medical, nutrition, and psychology telemedicine visits before surgery, especially for patients who reported a preference for using a video format.

As expected, the satisfaction ratings between the HTM group and the F2F group in our study were comparable. For all HCP visits, patients in

both groups reported a high rating regarding ease of connection and positive experience with individual HCPs and the care team overall. Patients in both groups agreed that appointments were easy to schedule, wait times for the visit were short, and the patient portal was helpful. Similarly, patients in both groups agreed that HCPs were responsive to their questions and concerns, spent adequate time with them, included them in decisions about their care, and were courteous, respectful, and trustworthy. They also reported that the care team overall worked together to coordinate care and included them in decision-making. Patients in both groups further indicated that they would recommend the care team to others who desired similar care. Despite the benefits of HTM care, some patients still prefer access to in-person visits, particularly with their physicians.[21,36] Thus, the convergence of available evidence suggests that offering hybrid pathways to care may promote engagement with MBS programs and that patients who choose telemedicine video visits are likely to be highly satisfied with this modality of care.[21,29,35,36,39]

In our analysis of the 15 patients who underwent surgery, patients in the HTM and F2F groups had comparable times to surgery completion, which is consistent with previous observational research.[31] In addition, financial data were collected regarding payor collection ratio, charge amount, and payment amount for each visit type. Consistent with our hypothesis, no significant differences were observed in the reimbursement ratio across all HCP visits. Although not statistically significant, less reimbursement was observed for telemedicine video visits for all HCPs. However, for nutrition visits, the HTM group had a significantly lower median charge amount ($268) than the F2F group ($423).

Lower charge amounts and reimbursement ratio may be attributable to more patients in the HTM group having Medicare as their insurance payor, as well as the use of differing primary and secondary diagnosis codes. The rate of reimbursement for obesity as a primary diagnosis may be lower than that for type 2 diabetes as a primary diagnosis (eg, 6 patients in the F2F group had type 2 diabetes compared with 1 patient in the HTM group). Obesity may be treated as a risk factor by the insurance payor rather than as a chronic disease, thereby limiting billable services.[40] Another possible explanation is that medical and surgical telemedicine video visits may lean toward lower complexity and thus lower reimbursement rates than in-person visits.[19,41] Variables that influence visit complexity are the number and severity of medical problems, extent of patient data review, surgical risk, and length of time spent with the patient. The use of lower-complexity visit types may be related to the appropriateness of telemedicine and an HCP's comfort with conducting a video visit to assess patients for surgery. Nonetheless, insurance payors have continued to provide coverage for telemedicine video visits for patients seeking MBS similarly to in-person visits.

4.1. Limitations

This study had several limitations. First, although the relatively small sample size is appropriate for a pilot study, it was not sufficiently powered to detect significant differences between groups. Therefore, the possibility of a type II error (ie, a false-negative finding) should be considered when interpreting results. Second, the response rate for the satisfaction survey varied. However, relatively low survey response rates are common and have been reported in recent investigations of telemedicine use in MBS care (range, 16%-37.4%).[21,35] Finally, 9 of 21 (43%) patients in the HTM group and 6 of 22 (27%) patients in the F2F group completed surgery (Fig. 1). Recruitment for the study started during a time of the rapidly accelerated use of semaglutide and tirzepatide for weight loss, possibly explaining why 30.2% of study participants (HTM, n = 7; F2F, n = 6) chose to initiate obesity management medications (OMMs) rather than pursue surgery.[42] Since 2023, the rapid rise in glucagon-like peptide-1 medication use has been accompanied by a decline in bariatric surgery procedures in the US, similar to what was observed in this study.[43] Furthermore, 34.8% (n = 15) of patients were lost to follow-up, which is common among patients seeking MBS.[44,45]

5. Conclusion

The rate of obesity in the US remains persistently high, and people living with this chronic, progressive disease need easier access to effective treatments such as MBS and OMMs. In addition, evidence to support the safety and effectiveness of telemedicine visits for patients seeking OMMs has increased. Preliminary data from this study support the viability of MBS programs offering an HTM care pathway to improve care access and scalability for patients with obesity. Offering a hybrid care pathway to MBS allows patients to choose what works best for their personal circumstances. In addition, it can reduce barriers to MBS, such as physical limitations and the financial and logistical burdens of the required visits. With increased flexibility and choice, patients may be more likely to complete the initial program visit and engage with the MBS program for the long term. Larger studies are needed to definitively confirm the effect of an HTM offering on MBS program access and surgery completion.

CRediT authorship contribution statement

Gretchen E. Ames: Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Funding acquisition, Conceptualization. **Jenna L. Pennella:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation. **Michael G. Heckman:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Hanna J. Sledge:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation. **Scott A. Lynch:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Enrique F. Elli:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization.

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The funding source did not have any involvement in study design; in the collection, analysis and interpretation of data; in the writing of the report; or in the decision to submit the article for publication.

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Data availability

All relevant data supporting the findings of this study are reported within the article or are available from the corresponding author upon reasonable request.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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