12-1-2021

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Obesity Surgery (2021) 31:5494–5496
https://doi.org/10.1007/s11695-021-05717-y

BRIEF COMMUNICATION

Adherence to Post-operative Appointments Is Associated with Weight Loss Following Bariatric Surgery

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Received: 7 June 2021 / Revised: 3 September 2021 / Accepted: 22 September 2021 / Published online: 14 October 2021

Keywords Adherence · Appointments · Compliance · Sleeve gastrectomy · Gastric bypass · Rouxen-Y

Methods

Patients and procedure

Patients who underwent a pre-surgical psychological evaluation were entered into a database and were included in this study if they underwent bariatric surgery. Participants ($N=210$) included patients who underwent sleeve gastrectomy or Roux-en-Y gastric bypass at a major metropolitan hospital system between 2016 and 2018. Retrospective chart review was used to collect demographic information, history of adherence to medical appointments, and weight loss outcomes. Adherence to medical appointments was examined in two ways: (1) pre-operatively as percentage of completed, canceled, and "no-showed" (i.e., missed) *healthcare appointments* during the two years prior to bariatric surgery, and (2) post-operatively as percentage of completed, canceled, and no-showed *bariatric appointments* in the first year after bariatric surgery. Post-operative bariatric appointments were routinely scheduled for all patients 1 month, 6 months, and 1 year after surgery. Weight loss outcomes included change in BMI (ΔBMI), percent total weight loss (%TWL), and percent excess weight loss (%EWL). These weight outcome measures are consistent with standardized outcomes reporting in bariatric surgery [1] and were calculated using patients' pre-operative weight recorded at their surgical consultation appointment and post-operative weight recorded at their 1-year follow-up appointment. For patients who did not attend their 1-year follow-up appointment, their electronic medical record was reviewed to obtain their weight within 3 months of their 1-year post-surgery date. Institutional Review Board approval was obtained from the health system, and informed consent was waived due to the retrospective methodology.

Analyses

Analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics and frequency analyses on demographic variables were conducted. Univariate linear regressions were used to determine relationships between pre- and post-operative adherence, post-operative adherence, demographic variables (e.g., age) and weight loss outcomes.

Results

Demographic characteristics of the sample are presented in Table 1. The sample was predominantly female and nearly equally divided between White and Black patients. On average, participants were middle-aged and completed some college. The average pre-surgical BMI was 45.96 kg/m2 ($SD=6.83$), with three-quarters of participants undergoing sleeve gastrectomy and one-quarter undergoing Roux-en-Y

Key Points • Pre-operative adherence to appointments was similar to adherence post-operatively.
• On average, participants attended 76 to 78% of scheduled appointments.
• Adherence to post-operative appointments was associated with greater weight loss.
• Older age is associated with greater adherence to post-operative appointments.

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Table 1 Patient demographics and characteristics

	M	*SD*
Age in years	46.02	10.15
Years of education	14.34	2.14
Weight measures		
Pre-surgical BMI	45.96	6.83
ΔBMI 1 year post-surgery	12.89	4.15
%TWL 1 year post-surgery	28.21%	7.63
%EWL 1 year post-surgery	65.18%	21.16
	n	%
Gender		
Female	178	84.8
Male	32	15.2
Race/ethnicity		
White	103	49.0
Black	89	42.4
Other	9	4.3
Missing	9	4.3
Surgery type		
Sleeve gastrectomy	157	74.7
Roux-en-Y gastric bypass	53	25.3

The entries in bold are significant at $p < .05$

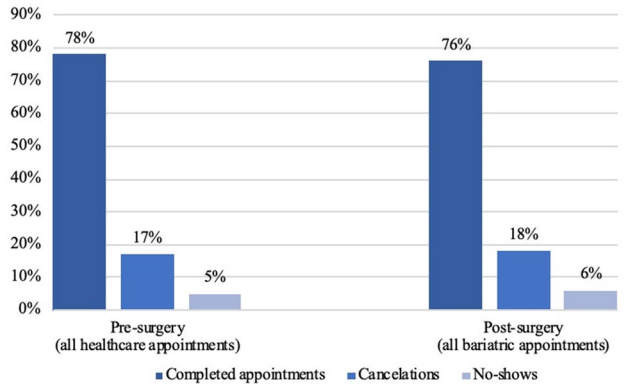

Fig. 1 Adherence to appointments before and after bariatric surgery

gastric bypass. Adherence to healthcare appointments pre-surgery was similar to adherence to bariatric appointments post-surgery (Fig. 1). On average, participants attended 76–78% of their scheduled appointments, canceled 17–18%, and no-showed 5–6%. Approximately half (45.7%) of the patients did not attend their 1-year follow-up appointment.

In univariate analyses, a higher rate of no-showed appointments before surgery predicted fewer completed post-operative bariatric appointments and more post-operative no-shows (Table 2). Younger age was also associated with higher rates of no-shows ($\beta = -0.22$, $p = 0.002$) and fewer post-operative completed appointments ($\beta = 0.14$, $p = 0.049$). Adherence to post-operative bariatric appointments, but not pre-operative healthcare appointments, was associated with weight loss outcomes after surgery (Table 3). A higher rate of canceled bariatric appointments after surgery was related to lower ΔBMI and %TWL, but not %EWL at 1-year post-surgery (Table 3).

Table 2 Pre-operative no-shows predict post-operative completed and no-showed appointments

	β	SE	*t*	*p*
Post-operative completed appointments	**−.14**	**.22**	**−2.01**	**.045**
Post-operative canceled appointments	−.07	.19	−1.04	.301
Post-operative no-showed appointments	**.34**	**.12**	**5.21**	**<.001**

The numbers in italics is the statistical significance ($p < 0.05$)

Table 3 Canceled post-operative bariatric appointments predict less weight loss

	β	SE	*t*	*p*
ΔBMI 1 year post-surgery	**−.17**	**1.64**	**−2.20**	**.029**
%TWL 1 year post-surgery	**−.17**	**.03**	**−2.10**	**.037**
%EWL 1 year post-surgery	−.08	.09	−.97	.335

The numbers in italics is the statistical significance ($p < 0.05$)

Conclusion

This study examined the relationship between adherence to medical appointments and weight loss outcomes following bariatric surgery. Previously reported rates of adherence to post-operative appointments vary widely with reported rates ranging from 37 to 93% [2–6]. Our results fall within the high end of this range, with participants attending 76% of their scheduled post-operative appointments. Yet, despite high *overall* adherence rates, only slightly more than half of our patients attended their 1-year follow-up appointment. This is considerably less than rates reported in other studies, which indicate an attendance rate of 70 to 75% for the 1-year follow-up appointment [4, 6, 7]. Overall, attendance rates in our sample were similar pre- and post-operatively whereas at least one other study found greater adherence to pre-operative, compared to post-operative, appointments [7]. Notably, the present study was conducted at a major metropolitan hospital with a racially diverse patient population.

Our findings showed that older age was associated with greater adherence to post-operative appointments and greater adherence was associated with more weight loss at 1-year follow-up. Findings regarding age are largely discrepant in the extant literature with several studies reporting positive associations with adherence [3, 4, 6] and nearly equally as many failing to find an association [2, 8]. Results of the present study provide support for this relationship.

Concerning adherence and weight loss outcomes, it is well established that post-operative adherence to lifestyle changes is associated with greater weight loss [5, 7]. We found that post-operative adherence to appointments was also related to greater weight loss, though a recent study by Reiber et al. [9] suggests that longer term (e.g., 3–5 years post-surgery) appointment adherence is not associated with weight loss outcomes. Few studies have examined the relationship between pre-operative appointment adherence and weight loss outcomes. While at least one study suggests that nonadherence to pre-operative appointments is associated with less weight loss at 2-year follow-up [7] we failed to find an association between pre-operative appointment adherence and weight loss outcomes at 1-year follow-up. The underlying mechanisms accounting for these differences are unclear at this time, but patients who are more adherent to appointments may also be more adherent to recommended lifestyle modifications that, in turn, optimize their weight loss success. Alternatively, it is possible that those who lose more weight are more likely to adhere to appointments and those who have poorer weight loss avoid follow-up.

Overall, results suggest that adherence to post-surgical bariatric appointments is associated with greater weight loss, and younger patients may be at risk for poorer adherence to these appointments. Future research should seek to better understand the relationship between age, weight loss, and adherence to improve retention of bariatric patients, especially younger patients.

Declarations

Ethics Approval and Consent to Participate All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. For this type of study formal consent is not required. Informed consent does not apply.

Conflict of Interest The authors declare no competing interests.

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