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## Bariatric surgery in cancer survivorship: Does a history of cancer affect weight-loss outcomes?

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### Abstract

**Objective**—Weight-loss is recommended for obese cancer survivors who are at increased risk of recurrence and non-cancer related mortality. It remains unknown if this vulnerable population benefits from bariatric surgery to the same extent as those without a history of cancer.

**Methods**—A retrospective chart review of 1013 patients revealed twenty-nine bariatric surgery patients with a history of cancer who were then matched to patients without a history of cancer.

**Results**—At one-year post-surgical follow-up, individuals with a history of cancer had lost less weight than those without a history of cancer (14.2 vs. 14.8); however this difference was not significant ( $p=0.76$ ).

**Discussion**—Cancer survivors appear to draw similar benefit from bariatric surgery as those without a history of cancer, although a larger study with greater statistical power to detect differences is needed to confirm these results. These preliminary results are encouraging in light of the increasing focus on weight-loss among this population.

### Keywords

Bariatric Surgery; Cancer Survivorship; Surgical Weight-loss

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Nearly two-thirds of the US population is overweight or obese, with this excess weight associated with increased risk of cardiovascular disease, diabetes and cancer.<sup>(1, 2)</sup> In line with rising obesity rates among the general population, it is estimated that over 65% of cancer survivors in the US are overweight or obese.<sup>(3)</sup> Obese survivors of cancer are at increased risk of recurrence and secondary cancers, as well as non-cancer related morbidity and mortality.<sup>(4)</sup>

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Advances in screening and treatment have resulted in the majority of individuals diagnosed with cancer predicted to live beyond five years.<sup>(5)</sup> This has brought cancer survivorship to the forefront of clinical efforts; including a renewed focus on the importance of health promotion among this growing survivor population.<sup>(6)</sup> National guidelines now stress the importance of maintaining a healthy weight in survivorship, and for those who are overweight or obese at the time of diagnosis, to lose weight through adoption of a healthy diet and engagement in physical activity.<sup>(7)</sup>

Despite efforts in public and health care spheres, sustained weight-loss remains a challenge, including for those with a history of cancer.<sup>(8)</sup> Obese individuals who possess comorbid disease and for whom lifestyle-based weight-loss interventions have been unsuccessful, bariatric surgery remains an important treatment approach.<sup>(9)</sup> In fact, Kim and colleagues estimated that approximately 8.2% of breast cancer patients seen at a community clinic met criteria for bariatric surgery.<sup>(10)</sup> Weight-loss surgery represents the most effective approach to producing significant and enduring weight-loss, and evidence suggests that this approach can resolve diabetes and reduce the risk of long-term morbidity and mortality, including a lowered risk of cancer diagnoses among women in the general population.<sup>(11–14)</sup>

As a consequence of improved survival and long-term prognosis across many common cancers, bariatric surgery is also becoming an increasingly viable option for obese cancer survivors.<sup>(15)</sup> Bariatric surgery represents a major surgical procedure, with subsequent risks as associated with any invasive procedure, as well as the need for intensive long-term follow-up.<sup>(16)</sup> In addition, cancer survivors represent a potentially vulnerable population, many of whom are managing late and long-term effects of their diagnosis, which could impair follow-up or surgical outcomes. For this reason, it is important that research examining the effectiveness and safety of bariatric surgery for survivors be undertaken, and the results used to help guide the development and implementation of care guidelines for this growing population.

Despite the potential health benefits of weight-loss surgery, there remains a dearth of literature on this topic in the context of cancer survivorship. An Italian research group reported a prevalence rate of 3.2% of pre-surgical cancer diagnoses among those undergoing bariatric surgery,<sup>(17)</sup> while Gusenoff described 36 women who had been diagnosed with breast cancer prior to bariatric surgery.<sup>(18)</sup> A comparison of weight-loss outcomes were not reported in either study however. The current report presents the results of a preliminary retrospective investigation of weight-loss surgery outcomes among a cohort of cancer survivors compared to matched controls without a history of cancer. The primary outcome examined was weight-loss at one-year post-surgery. Given the exploratory nature of the current study, and paucity of previous research, no pre-specified hypotheses were proposed.

## Methods

### Participants and Procedure

A retrospective chart review was undertaken of 1013 patients who underwent bariatric surgery between 2004 and 2011. The inclusion criteria for analysis were: (1) documentation of any diagnosed malignant neoplasm prior to undergoing bariatric surgery based on either a

pathology report or actively receiving chemotherapy treatment according to the patients' charts, (2) subsequent to their cancer diagnosis, undergoing a Gastric Bypass, Band placement, Sleeve Gastrectomy or Biliopancreatic Diversion with Duodenal Switch (BPD/DS), (3) attended a one-year follow-up medical appointment (9–15 month range) where their weight was recorded, and (4) be matched to a patient with no history of cancer based on age at time of bariatric surgery ( $\pm 3$  years), gender, surgery type and pre-surgical body mass index (BMI:  $\pm 2$  BMI points). All surgical procedures were performed laparoscopically at a large urban hospital by one of three experienced surgeons. In line with national guidelines,<sup>(19)</sup> cancer survivors were defined as individuals who had been diagnosed with any form of cancer prior to undergoing weight-loss surgery, irrespective of treatment outcome (e.g. recurrence, progression, remission). This study received IRB approval by the primary institution.

### Analytic Strategy

Analyses were conducted using SPSS software. Descriptive statistics are presented and independent sample t-tests were conducted used to examine whether any differences in weight-loss existed between groups based on mean BMI change at one-year, percentage excess weight lost and mean percentage of excess BMI lost (%EBMIL). Preliminary comparisons of differences based on surgical procedure type were also examined.

### Results

From this review, 45 patients were identified as possessing a cancer history as documented in their medical chart, of which 29 met all inclusion criteria and were successfully matched to patients without a history of cancer. The study sample constituted 29 individuals with a history of cancer who underwent bariatric surgery. This group included 21 females and 8 males, a distribution that reflected the gender distribution of all patients receiving bariatric surgical procedures at our surgical center. Individuals were on average 54.1 (SD=9.8) years old and 5.9 (SD=6.2, Range=0–22) years post-treatment at the time they underwent bariatric surgery. The most frequently diagnosed forms of cancer were breast (28%), skin (21%), prostate (10%) and colon (4%). There were no significant differences in pre-surgical BMI, gender, age at time of surgery, and the type of surgery between the two groups. Further details are presented in Table 1.

At one-year post-surgical follow-up, individuals with a history of cancer had lost slightly less weight as evaluated by BMI change compared to those without a history of cancer (14.2 vs. 14.8, mean difference = 0.6 BMI points,  $p=0.76$ ; %EBMIL 62.01 vs 64.95,  $p=0.69$ ). We observed the greatest weight-loss among those cancer survivors undergoing the Gastric Bypass procedure (BMI Change=16.9, %EBMIL=77.9), while those undergoing Band placement had the least amount of weight-loss at one-year follow-up (BMI Change=5.2, %EBMIL=27.3). Demographic characteristics and group-based differences in weight-loss across the four types of surgical procedures are presented in Table 1.

## Discussion

The current study reports preliminary evidence that survivors of cancer achieve similar surgical weight-loss outcomes compared to peers without a history of cancer. There were no statistical differences established between groups or across surgical procedure types. Cancer survivors are now living longer and healthier lives, and thus it is important that the full range of appropriate weight-loss treatment modalities be available to them to promote health among this growing population.

These preliminary results provide encouraging evidence that cancer survivors can benefit from bariatric surgery. The majority of cancer survivors in the US are overweight or obese at the time of diagnosis.<sup>(3)</sup> These individuals represent a unique patient population that may be managing late and long-term effects of treatment and may experience additional barriers to engaging in effective weight-loss interventions and adhering to follow-up care guidelines. Effective and sensitive targeted health promotion messages and interventions are needed to ensure that positive long-term health outcomes are achieved among this group.

The importance of weight-loss in the context of cancer survivorship has been recognized.<sup>(7)</sup> Evidence suggests that lifestyle change (weight-loss, healthy diet, physical activity) may be associated with a decreased risk of recurrence, secondary cancers, and non-cancer related morbidity and mortality among cancer survivors.<sup>(20)</sup> There is suggestive evidence that bariatric surgery among the general population may be associated with reduced cancer risk, particularly among women,<sup>(11)</sup> and that purposeful weight-loss after cancer treatment may be associated with positive changes in cancer-related biomarkers.<sup>(21)</sup> Further study is needed to determine whether weight-loss due to lifestyle change or surgical intervention can confer survival benefits for those with a history of cancer and by what mechanism this may be achieved.

To the authors' knowledge, this is the first investigation of bariatric surgery weight-loss outcomes among cancer survivors; however it is important to recognize its limitations. This was retrospective study that employed a relatively small sample of patients from a single institution. It was not designed or intended to provide prevalence rates of cancer among individuals undergoing bariatric surgical procedures or to provide a definitive answer on the efficacy of surgery among cancer survivors. The small sample size may also have impaired the ability to detect significant differences between groups or within surgical procedure types. Further, it was not possible to examine the potential relationship between survivors' cancer status (recurrence, remission) and post-operative weight-loss, this remains an important area for future investigation. Finally, we were unable to access detailed information pertaining to participants' cancer diagnosis, treatment and prognosis, including clinical and pathology reports. Once again, this would be important information to examine in future research studies. In recognition of these limitations it is important to note that further work is needed before it can be concluded that survivors draw similar benefits from bariatric surgery as those without a history of cancer, or until such findings can be considered sufficiently robust to generalize to the broader cancer survivor community.

## Conclusion

This preliminary study found no statistically significant differences in one-year weight-loss outcomes between those with and without a history of cancer undergoing bariatric surgery. These results suggest potentially equal benefit of bariatric surgery for cancer survivors and are encouraging in light of the increased focus on weight-loss and health promotion among this growing population.

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Table 1

## Demographic and Clinical Characteristics of Sample

	Surgery Type							
	Band (n=7 <sup>^</sup> )		Gastric Bypass (n=12 <sup>^</sup> )		Sleeve (n=7 <sup>^</sup> )		BPD/DS (n=3 <sup>^</sup> )	
	Cancer	Match	Cancer	Match	Cancer	Match	Cancer	Match
AGE AT SURGERY (years)	55.7	53.7	56.2	55	60.6	59.1	42	39.3
MONTHS POST SURGERY	12.3	11	12.3	12.5	12.4	11.9	13	14.3
PRE-SURGICAL BMI	45.3	44.4	46.8	46.8	52.7	53.8	49	49.5
9-15 MONTHS POST-BMI	40.1	38.3	29.9	29.5	39.3	37.2	31.8	28
BMI CHANGE	5.2	6.1	16.9	17.3	14.8	16.5	22.8	21.0
%BMI CHANGE	11.6	14.1	35.5	36.5	27.9	30.8	46.1	41.7
%EXCESS BMI LOST	27.3	34.1	77.9	79.8	55.4	61.8	95.7	84.8
<b>%EXCESS WEIGHT LOST</b>	<b>21.7</b>	<b>27.0</b>	<b>66.5</b>	<b>67.2</b>	<b>49.7</b>	<b>54.0</b>	<b>82.3</b>	<b>74.1</b>
<i>P VALUE for BMI CHANGE</i>	0.62		0.86		0.56		0.73	
<i>P VALUE for %EBMIL</i>	0.5		0.81		0.49		0.26	
<b><i>P VALUE for %EWL</i></b>	<b>0.55</b>		<b>0.92</b>		<b>0.55</b>		<b>0.19</b>	

Definitions: BPD/DS: Biliopancreatic Diversion with Duodenal Switch; BMI: Body Mass Index, %EBMIL: Percentage of Excess Body Mass Index Lost, % EWL: Percentage of excess weight lost.

<sup>^</sup> Number of patients with a history of cancer