

Treatment satisfaction with different weight loss methods among respondents with obesity

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What is already known about this subject?

- A variety of methods are recommended for weight loss, including dietary restriction, physical activity, pharmacotherapy and bariatric surgery.
- Lifestyle changes, including diet and exercise, are most commonly recommended forms of weight loss but may not be sufficient for weight management.

What does this study add?

- The present study indicates that respondents with obesity are more satisfied with pharmacotherapy/surgical approaches to weight loss than lifestyle changes alone, suggesting the importance for integrating those weight loss treatments into weight management for the appropriate patients.

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Summary

Satisfaction with weight loss (WL) methods has been correlated with the effectiveness, long-term compliance and commitment to weight management. This study explored treatment satisfaction associated with different WL methods among patients with obesity. Cross-sectional data were analysed from the 2012 US National Health and Wellness Survey. Respondents with obesity were categorized as having a WL procedure (e.g., gastric bypass and gastric banding) or using a prescription medication for WL (Sur/Rx), vs. using self-modification WL techniques (e.g., diet, exercise and WL supplements). Overall satisfaction with current WL methods was assessed among the obese and the overweight/obese with type 2 diabetes mellitus (T2DM). Of the 22 927 respondents with obesity, 58.4% took no current action to lose weight, 2.3% were identified as Sur/Rx and 39.3% were identified as self-modification. The Sur/Rx group reported being very/extremely satisfied more frequently than the self-modification group (39.3% vs. 20.2%, $P < 0.001$). Similarly, respondents with T2DM that were overweight/obese reported higher satisfaction in the Sur/Rx vs. the self-modification group (46.6% vs. 22.7%, $P < 0.001$). Satisfaction with WL methods was greater for the Sur/Rx vs. the self-modification group. Data suggest the importance of including bariatric surgery and pharmacotherapy as an integral part in comprehensive WL management.

Keywords: Body mass index, type 2 diabetes, weight loss medication, weight loss satisfaction.

Introduction

The worldwide obesity epidemic is a growing problem (1,2), with rates in the United States (US) increasing from 13% in the 1960s to 36% by 2012 (3). According to data from the Centers for Disease Control and Prevention, over

35% of the US adult population was considered obese [body mass index (BMI) > 30] in 2013 (4). This rise in obesity rates in the US is alarming especially considering the large number of comorbidities associated with obesity, including type 2 diabetes mellitus (T2DM), cardiovascular disease, osteoarthritis and certain cancers (5–7). Obesity

has also been linked with a shorter life expectancy, largely attributable to these comorbidities (8,9). Moreover, obesity has been linked with negative outcomes on individuals' health-related quality of life (HRQoL) (10). A long-term study found that both overweight and obese individuals have lower HRQoL than individuals of a healthy weight (11).

A number of weight loss (WL) techniques have been recommended by the National Heart, Lung and Blood Institute (NHLBI) (12) and Endocrine Society (13) for overweight and obese adults in the US, including dietary restrictions, physical activity, behaviour therapy, pharmacotherapy and surgery. Lifestyle changes such as diet and exercise are considered to be the backbone of weight management for all patients with BMI ≥ 25 (14). WL pharmacotherapy is recommended in conjunction with diet and exercise for adult patients with a BMI ≥ 27 and a weight-related medical problem or those with a BMI ≥ 30 . WL surgery is suggested only for patients with clinically severe obesity (BMI ≥ 40 or ≥ 35 with a weight-related comorbidity). WL surgery should only be considered when alternative methods have failed and the patient is at risk of obesity-related morbidity or mortality (12).

Although self-modification steps are considered as the backbone of weight management (14), they may not be enough to help obese individuals have successful and long-term WL when used as the only WL method (15). In line with this theory, recent guidelines published by the Endocrine Society (in 2015) with support from the Obesity Society (TOS) and the European Society of Endocrinology have recommended that a combination of lifestyle changes with WL medications may be the best form of WL for many patients (13). These combined approaches are strongly recommended for individuals who have difficulty losing weight with lifestyle changes alone (13).

Despite the effectiveness of medications and bariatric surgery as WL strategies, they are still relatively underutilized (16), because of a variety of reasons including concerns about safety, effectiveness, cost and stigma (16–19). For instance, patients who were perceived to have lost weight through surgery were rated significantly more negatively across the domains of laziness, competence and responsibility than those who lost weight through exercise or a combination of surgery and exercise (19). As such, patients may be less likely to engage in those treatments.

Another important reason that pharmacotherapy and bariatric surgery WL methods are underutilized is that a surprising number of primary care physicians do not counsel patients on weight management (20). One study found that nearly 50% of obese individuals reported that their physicians did not give any recommendation on weight management (21). Of those physicians who do discuss weight management, the primary WL method

recommendation is self-modification of behaviours, such as exercise and diet (22).

Treatment satisfaction has been found to affect the patient's health-related decision-making and quality of life (23,24) and could play an important role in weight management, which requires continuous effort from the patient. In fact, treatment satisfaction has been associated with increased effectiveness of WL methods and has been shown to predict better long-term compliance and commitment, which is essential in chronic weight management (25,26). For instance, individuals' satisfaction with WL methods has been linked with greater amounts of WL (27,28). The objective of this study was to explore treatment satisfaction associated with different WL methods among respondents with obesity (BMI ≥ 30) and separately among respondents with T2DM who are overweight/obese, providing important patient experience on weight management.

Methods

Sample

Data for this analysis were taken from the 2012 US National Health and Wellness Survey (NHWS), a cross-sectional, self-administered, Web-based survey given to a sample of adults (≥ 18 years). A random stratified sampling framework was used to survey people from January to August to ensure that the demographic composition of the sample was identical to that of the corresponding adult population as measured by the US Census. Survey respondents were identified through a Web-based opt-in consumer panel maintained by Lightspeed Research (LSR). Panel members were recruited via opt-in e-mails, e-newsletters, online banners and panel partner co-registration. Panelists explicitly volunteered for panel membership and were registered through unique e-mail addresses, and each completed a demographic profile.

Comparisons between NHWS data and other established sources [US Census, National Health Interview Survey (NHIS), National Health and Nutrition Examination Survey (NHANES), etc.] have been made elsewhere and demonstrate that the NHWS data are consistent with these established data sources (29,30). The 2012 US NHWS, used for the present study, was reviewed and approved by the Essex IRB (Lebanon, NJ, USA). All participants provided informed consent and were compensated for their participation with LSR points, which can be traded in for prizes.

Inclusion and exclusion criteria

The NHWS asked respondents to report their height and weight information, from which BMI was calculated. Underweight, normal weight and respondents who did not

provide weight or height information were excluded from this study.

Only respondents who reported being overweight or obese (BMI ≥ 27) were included in the present analyses. Two separate analysis groups were examined (i) individuals who were obese (BMI ≥ 30) and (ii) individuals with T2DM who were overweight or obese (BMI ≥ 27). Respondents with T2DM who were overweight or obese were identified with the following question: 'Has your diabetes been diagnosed by a physician?'

Weight loss approach

Respondents were asked if they were currently taking steps to lose weight ('Are you currently taking steps to lose weight?'). Respondents who indicated 'yes' were further asked the following questions: (i) 'Do you currently use a prescription medication to lose weight?'; (ii) 'Do you use an over-the-counter or herbal product (e.g., Dexatrim® and caffeine) to lose weight?'; (iii) 'Do you use a weight management program (e.g., Jenny Craig® and Weight Watchers®) to lose weight?'; and (iv) 'Have you spoken to your doctor about the steps you are currently taking to lose weight?', those who selected 'yes' to this question were further asked 'Please indicate if you have taken any of the following WL methods for your steps to lose weight' (choices included consulting a specialist, diet, exercise, surgical procedure, weight management program, gastric band procedures, over-the-counter medication or herbal product, using a prescription drug).

Respondents actively trying to lose weight

Respondents were categorized as having a WL surgical procedure (e.g., gastric bypass surgery, stomach stapling and gastric band procedure) or currently using a prescription medication (e.g., phentermine, sibutramine and orlistat) for WL (the surgical procedure/prescription use group), vs. using self-modification WL techniques (e.g., diet, exercise, over-the-counter medication or herbal product, joined weight management program, and use any WL supplements or food).

Respondents taking no action towards weight loss

Respondents were categorized as taking no current action if they met one of the following criteria: (i) selected 'no' to the question, 'Are you currently taking steps to lose weight?' (ii) selected 'yes' to this question, but did not speak to their doctor about their WL steps and did not choose any of the listed WL methods or (iii) when asked to specify, they did not choose any of the listed WL methods (surgical procedure/prescription use group or self-modification group).

Measures

Demographics

Respondent demographics included age, sex (female vs. male as reference), race/ethnicity (non-Hispanic Black, Hispanic and other, vs. non-Hispanic White as reference), education (college degree or above vs. less than college degree as reference), annual household income (\$25 000–\$49 999, \$50 000–\$74 999, \$75 000 and above, or declined to answer, with less than \$25 000 as reference), employment status (currently employed vs. not employed as reference), marital status (married/living with partner vs. single/divorced/separated/widowed as reference) and health insurance (yes vs. no as reference).

Body mass index

BMI values were calculated based on respondents' answers to the following two questions: (i) 'What is your height?' and (ii) 'What is your weight?' BMI categories utilized in the present study were broken into the following groups: overweight (BMI = 25 to <30), obese class I (BMI = 30 to <35), obese class II (BMI = 35 to <40) and obese class III (BMI = 40+) as reference.

Health history characteristics

In addition to BMI, health history characteristics included smoking status (currently smoke vs. not as reference), alcohol consumption (drink vs. do not drink alcohol as reference), experiencing depression in the past 12 months (yes vs. no as reference) and experiencing sleep difficulties in the past 12 months (yes vs. no as reference). Having had surgery (non-WL surgery) in the past 12 months (yes vs. no as reference) was also assessed. Self-reported diagnosed comorbidity data were used to calculate a comorbidity burden score using an adjusted Charlson comorbidity index (CCI) (31). Higher CCI index scores indicate greater comorbid burden on the individual and prospective likelihood of mortality.

Overall satisfaction with weight loss methods

Satisfaction with WL methods was measured using a single-item ('Overall, how satisfied are you with the WL methods you are currently using?'), with a 7-point Likert-type response scale from 1 to 7 (i.e., 1 = extremely dissatisfied, 2 = very dissatisfied, 3 = somewhat dissatisfied, 4 = neither dissatisfied nor satisfied, 5 = somewhat satisfied, 6 = very satisfied, 7 = extremely satisfied). Results were dichotomized as unsatisfied (1–5) vs. very/extremely satisfied (6,7), and satisfied (3–7) vs. extremely/very unsatisfied (1–2).

Statistical analyses

Differences across WL categories were analysed for demographics and health history characteristics using Chi-square tests for categorical variables and ANOVAs for continuous variables. To make sure the surgical procedure/prescription group and the self-modification group were comparable (other than form of WL), these groups were matched on the demographic, BMI and health history characteristic variables noted above, via propensity scores using a 1:2 ratio. SAS/STAT® LOGISTIC procedure code was used to create the propensity scores. The matching was completed using the greedy matching techniques. The algorithm proceeds by making the 'best' matches first and the 'next-best' matches next, in a hierarchical sequence until no more matches can be made. Using a 1:2 matching algorithm, each surgical procedure/prescription use respondent was matched with two respondents from the self-modification group. The 1:2 matching allowed for greater power for the overall study.

Post-match, differences between these groups were re-examined to confirm the matching procedure utilized. Additionally, the difference on treatment satisfaction of WL methods was assessed. Chi-squares and ANOVA tests were used to test for statistical differences. For all analyses, $P < .05$ was considered statistically significant.

Results

Respondents with obesity

Of the 22 927 respondents with obesity (BMI ≥ 30), 58.4% ($n = 13\ 393$) took no current action to lose weight, 2.3% ($n = 520$) were in the surgical procedure/prescription use group and 39.3% ($n = 9014$) were included in the self-modification group. The average age was 50.6 years ($SD = 15.3$). Participants were 50.0% female and predominately White (73.2%).

Respondents in the surgical procedure/prescription use group were younger, likely to be female, non-White, obese class III, had health insurance and reported more comorbidity burden compared with the self-modification group (see Table 1). Among the respondents in the surgical procedure/prescription use group, 73.3% reported also dieting to lose weight and 61.9% reported exercising to lose weight (see Table 2). Within the matched samples, the surgical procedure/prescription use group were more likely to report joining a weight management program than the self-modification group (21.4% vs. 14.9%, $P = 0.001$; see Table 3). After propensity matching, the surgical procedure/prescription use group reported being very/extremely satisfied more frequently than the self-modification group (39.3% vs. 20.2%, $P < 0.001$; see Fig. 1). Also, the surgical procedure/prescription use group reported being extremely/

very unsatisfied less frequently than the self-modification group (11.4% vs. 15.8%, $P = 0.019$). There was no statistical difference in satisfaction with WL methods between those using a prescription medication to lose weight and those who had a surgical procedure to lose weight ($P > 0.05$; see Fig. 2).

Respondents with T2DM who were overweight or obese

Of the 5726 respondents with T2DM who were overweight or obese (BMI ≥ 27), 49.6% took no current action to lose weight, 2.9% were in the surgical procedure/prescription use group and 47.5% were in the self-modification group. The average age was 59.5 years ($SD = 11.8$). Participants were 40.0% female, predominately White (77.14%) and 88.3% had health insurance.

Respondents with T2DM in the surgical procedure/prescription use group were younger and more likely to be female, non-White, single, obese class III and had health insurance. No differences on the CCI were observed across the groups (see Table 4). Among the respondents in the surgical procedure/prescription use group, 75.8% reported also dieting to lose weight and 60.0% reported exercising to lose weight (see Table 5). Within the matched samples, no significant difference was found between the surgical procedure/prescription use group and the self-modification group on respondents joining a weight management program (20.5% vs. 14.6%, $P = 0.100$; see Table 6). After propensity matching, satisfaction was higher for the surgical procedure/prescription use group vs. the self-modification group (46.6% vs. 22.7%, $P < 0.001$; see Fig. 3). Also, the surgical procedure/prescription use group reported being extremely/very unsatisfied less frequently than the self-modification group (6.8% vs. 17.4%, $P = 0.002$). No statistical difference in satisfaction with WL methods was found between those using a prescription medication to lose weight and those who had a surgical procedure to lose weight (41.5% vs. 47.6%, $P > 0.05$; see Fig. 4).

Discussion

A prior review paper states that limited data are available on patient satisfaction regarding bariatric surgery (32) and guidelines by the NHLBI (12) and Endocrine Society (13,15) state that WL pharmacotherapy is recommended in conjunction with diet and exercise for adult patients with a BMI ≥ 27 with a weight-related medical problem or those individuals with a BMI ≥ 30 . Therefore, the aim of this study was to examine satisfaction with different WL methods (including bariatric surgery and pharmacotherapy) among individuals with obesity (BMI ≥ 30) as well as those with T2DM (BMI ≥ 27 with T2DM being a weight-related comorbidity). Of all individuals who were overweight or

Table 1 Demographic and health history characteristics among respondents with obesity (body mass index ≥ 30) by weight loss categories

	Total (n = 22 927)	Surgical procedure/prescription use (n = 520)	Self-modification (n = 9014)	No current action (n = 13 393)	P- Value
Age (years), mean \pm SD	50.65 \pm 15.26	47.79 \pm 13.66	52.10 \pm 14.98	49.78 \pm 15.43	<.001
Gender					<.001
Female (%)	11 459 (49.98%)	356 (68.46%)	4816 (53.43%)	6287 (46.94%)	
Male (%)	11 468 (50.02%)	164 (31.54%)	4198 (46.57%)	7106 (53.06%)	
Race/ethnicity					<.001
Non-Hispanic white (%)	16 777 (73.18%)	342 (65.77%)	6577 (72.96%)	9858 (73.61%)	
Non-Hispanic black (%)	3151 (13.74%)	95 (18.27%)	1267 (14.06%)	1789 (13.36%)	
Hispanic (%)	1887 (8.23%)	50 (9.62%)	702 (7.79%)	1135 (8.47%)	
Other ethnicity (%)	1112 (4.85%)	33 (6.35%)	468 (5.19%)	611 (4.56%)	
Married/living with partner (%)	13 540 (59.06%)	306 (58.85%)	5381 (59.70%)	7853 (58.64%)	0.284
College educated (%)	7790 (33.98%)	205 (39.42%)	3440 (38.16%)	4145 (30.95%)	<.001
Annual household income					<.001
<\$25 K (%)	5256 (22.92%)	104 (20.00%)	1810 (20.08%)	3342 (24.95%)	
\$25 K to <\$50 K (%)	6736 (29.38%)	157 (30.19%)	2591 (28.74%)	3988 (29.78%)	
\$50 K to <\$75 K (%)	4487 (19.57%)	111 (21.35%)	1844 (20.46%)	2532 (18.91%)	
\$75 K or more (%)	5024 (21.91%)	122 (23.46%)	2235 (24.79%)	2667 (19.91%)	
Decline to answer (%)	1424 (6.21%)	26 (5.00%)	534 (5.92%)	864 (6.45%)	
Currently employed (%)	11 394 (49.70%)	265 (50.96%)	4422 (49.06%)	6707 (50.08%)	0.274
Insured (%)	18 802 (82.01%)	470 (90.38%)	7856 (87.15%)	10 476 (78.22%)	<.001
BMI category					<.001
Obese class I (%)	12 724 (55.50%)	187 (35.96%)	4613 (51.18%)	7924 (59.17%)	
Obese class II (%)	5724 (24.97%)	151 (29.04%)	2407 (26.70%)	3166 (23.64%)	
Obese class III (%)	4479 (19.54%)	182 (35.00%)	1994 (22.12%)	2303 (17.20%)	
Consume alcohol (%)	13 892 (60.59%)	330 (63.46%)	5568 (61.77%)	7994 (59.69%)	0.003
Smoking behaviour					<.001
Non-smoker (%)	11 393 (49.69%)	259 (49.81%)	4509 (50.02%)	6625 (49.47%)	
Former smoker (%)	7942 (34.64%)	176 (33.85%)	3376 (37.45%)	4390 (32.78%)	
Current smoker (%)	3592 (15.67%)	85 (16.35%)	1129 (12.52%)	2378 (17.76%)	
Surgery or a procedure (past 12 months) (%)	4243 (18.51%)	179 (34.42%)	1899 (21.07%)	2165 (16.17%)	<.001
Charlson comorbidity index, mean \pm SD	0.61 \pm 1.11	0.84 \pm 1.28	0.72 \pm 1.17	0.52 \pm 1.05	<.001
Experienced sleep difficulties (past 12 months) (%)	6348 (27.69%)	193 (37.12%)	2790 (30.95%)	3365 (25.13%)	<.001
Experienced depression (past 12 months) (%)	5665 (24.71%)	193 (37.12%)	2366 (26.25%)	3106 (23.19%)	<.001

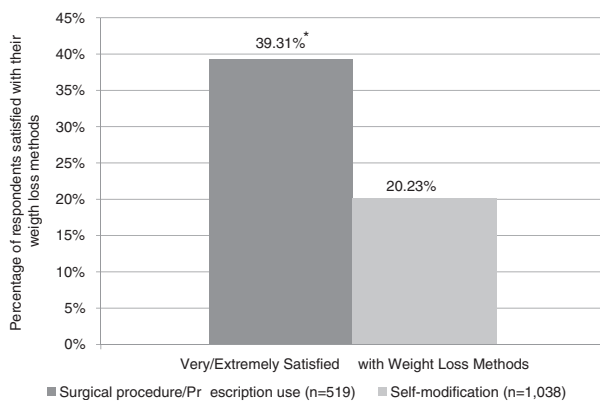
BMI, body mass index.

Table 2 Weight loss methods among respondents with obesity (body mass index ≥ 30)

	Total (n = 520)	Surgical procedure (n = 312)	Current prescription (n = 208)	P- Value
Surgical procedure (e.g., gastric bypass surgery, stomach stapling and gastric binding) (%)	226 (43.46%)	226 (72.44%)	0 (0.00%)	N/A
LAP-BAND® system or REALIZE® band procedure (%)	110 (21.15%)	110 (35.26%)	0 (0.00%)	N/A
Weight loss prescription medication (%)	230 (44.23%)	22 (7.05%)	208 (100.0%)	N/A
Over-the-counter weight loss medication (%)	73 (14.04%)	37 (11.86%)	36 (17.31%)	0.080
Weight management program (e.g., Weight Watchers® and Jenny Craig®) (%)	111 (21.35%)	73 (23.40%)	38 (18.27%)	0.162
Diet supplements or foods (e.g., Slim Fast®) (%)	153 (29.42%)	84 (26.92%)	69 (33.17%)	0.125
Diet to lose weight (%)	381 (73.27%)	233 (74.68%)	148 (71.15%)	0.373
Exercise to lose weight (%)	322 (61.92%)	191 (61.22%)	131 (62.98%)	0.685

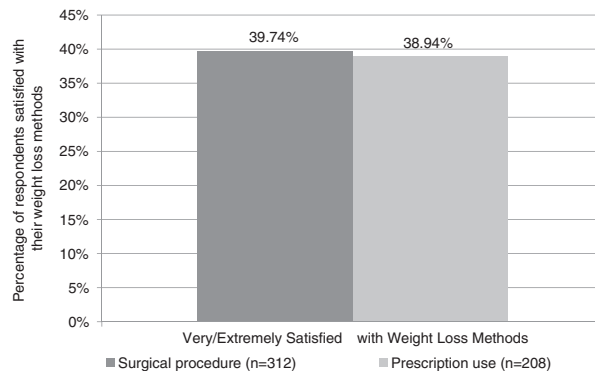
Table 3 Weight loss methods among propensity matched respondents with obesity (body mass index ≥ 30)

	Total (n = 1557)	Surgical procedure/prescription use (n = 519)	Self-modification (n = 1038)	P- Value
Over-the-counter weight loss medication (%)	143 (9.18%)	73 (14.07%)	70 (6.74%)	<.001
Weight management program (e.g., Weight Watchers® and Jenny Craig®) (%)	266 (17.08%)	111 (21.39%)	155 (14.93%)	0.001
Diet supplements or foods (e.g., Slim Fast®) (%)	373 (23.96%)	153 (29.48%)	220 (21.19%)	<.001
Diet to lose weight (%)	819 (52.60%)	380 (73.22%)	439 (42.29%)	<.001
Exercise to lose weight (%)	691 (44.38%)	321 (61.85%)	370 (35.65%)	<.001

**Figure 1** Proportion of respondents with obesity (body mass index ≥ 30) satisfied with their weight loss methods. Note: One respondent in the surgical procedure/prescription use group could not be matched with a respondent in the self-modification group. * $P < 0.001$.

obese in the present sample, which is representative of the national US population, nearly 60% reported not taking steps to lose weight. Among this high rate of individuals who were overweight or obese, taking no action steps to lose weight may be due to past failure of weight management (33). Other reasons could include the blame and stigma that often affects individuals with obesity for ‘causing’ their condition (34), and importantly the low number of physicians who discuss WL options with their patients as suggested in previous research (20,35). Results from the present study suggest that there is a need for improving patient education and strengthening patient–physician communication on weight management.

In the present study, among those who took measures to lose weight, satisfaction was greater for the surgical procedure/prescription use group vs. the self-modification only group. Furthermore, no difference was found for treatment satisfaction between surgical procedures and WL prescription medications, indicating that both of these methods of WL were equally as satisfying. This finding fits in line with prior research that indicates that self-modification tactics (such as diet and exercise) are associated with less WL than alternative means (such as bariatric or bypass surgery) (15,36) and that individuals often report ‘disappointing’

**Figure 2** Proportion of respondents with obesity (body mass index ≥ 30) satisfied with a surgical procedure vs. prescription medication use for weight loss.

WL results from self-modification methods (37). Furthermore, a prior study reported an average patient satisfaction score of 7.7 (of 10) for bariatric surgery (38) and past research indicates that bariatric surgery is associated with improvement in patient quality of life (32,38,39). Also, greater WL, better diet quality and increased physical activity have been found to be predictors of satisfaction with a WL program (40).

Some of the inadequacy of diet and exercise alone as effective long-term WL strategies may be related to individuals’ ineffective ability to adhere to recommendations. For instance, prior research suggests few individuals reported following the recommended guidelines combination of reduced caloric intake and exercise (41) by NHLBI and the Dietary Guidelines Advisory Committee of the US, and only half of individuals attempting to lose weight meet the recommended criteria of 150 min per week or more of exercise (42). These low adherence rates to specific recommendations for diet and exercise suggest that diet and exercise alone may not be linked to long-term WL or are difficult to adhere to over time. Research based on twins and family studies also indicated that certain biologic and genetic factors may be associated with energy balance or eating behaviours and consequently promote obesity (43,44), which can be difficult to manage with lifestyle modifications alone. Therefore, combining WL medications

Table 4 Demographic and health history characteristics among respondents with type 2 diabetes mellitus that are overweight or obese (body mass index ≥ 27) by weight loss categories

	Total (n = 5726)	Surgical procedure/ prescription use (n = 165)	Self-modification (n = 2722)	No current action (n = 2839)	P- Value
Age (years), mean \pm SD	59.52 \pm 11.82	54.87 \pm 10.38	59.82 \pm 11.36	59.50 \pm 12.27	<.001
Gender					<.001
Female (%)	2294 (40.06%)	104 (63.03%)	1153 (42.36%)	1037 (36.53%)	
Male (%)	3432 (59.94%)	61 (36.97%)	1569 (57.64%)	1802 (63.47%)	
Race/ethnicity					0.033
Non-Hispanic white (%)	4417 (77.14%)	114 (69.09%)	2124 (78.03%)	2179 (76.75%)	
Non-Hispanic black (%)	647 (11.30%)	31 (18.79%)	293 (10.76%)	323 (11.38%)	
Hispanic (%)	389 (6.79%)	11 (6.67%)	170 (6.25%)	208 (7.33%)	
Other ethnicity (%)	273 (4.77%)	9 (5.45%)	135 (4.96%)	129 (4.54%)	
Married/living with partner (%)	3482 (60.81%)	92 (55.76%)	1641 (60.29%)	1749 (61.61%)	0.242
College educated (%)	1954 (34.13%)	62 (37.58%)	965 (35.45%)	927 (32.65%)	0.057
Annual household income					0.072
<\$25 K (%)	1316 (22.98%)	37 (22.42%)	610 (22.41%)	669 (23.56%)	
\$25 K to <\$50 K (%)	1699 (29.67%)	54 (32.73%)	777 (28.55%)	868 (30.57%)	
\$50 K to <\$75 K (%)	1130 (19.73%)	35 (21.21%)	539 (19.80%)	556 (19.58%)	
\$75 K or more (%)	1235 (21.57%)	33 (20.00%)	638 (23.44%)	564 (19.87%)	
Decline to answer (%)	346 (6.04%)	6 (3.64%)	158 (5.80%)	182 (6.41%)	
Currently employed (%)	2071 (36.17%)	66 (40.00%)	982 (36.08%)	1023 (36.03%)	0.582
Insured (%)	5057 (88.32%)	157 (95.15%)	2458 (90.30%)	2442 (86.02%)	<.001
BMI category					<.001
Overweight (%)	1274 (22.25%)	17 (10.30%)	493 (18.11%)	764 (26.91%)	
Obese class I (%)	1992 (34.79%)	45 (27.27%)	951 (34.94%)	996 (35.08%)	
Obese class II (%)	1246 (21.76%)	39 (23.64%)	656 (24.10%)	551 (19.41%)	
Obese class III (%)	1214 (21.20%)	64 (38.79%)	622 (22.85%)	528 (18.60%)	
Consume alcohol (%)	2915 (50.91%)	96 (58.18%)	1392 (51.14%)	1427 (50.26%)	0.134
Smoking behaviour					<.001
Non-smoker (%)	2430 (42.44%)	92 (55.76%)	1187 (43.61%)	1151 (40.54%)	
Former smoker (%)	2481 (43.33%)	57 (34.55%)	1217 (44.71%)	1207 (42.51%)	
Current smoker (%)	815 (14.23%)	16 (9.70%)	318 (11.68%)	481 (16.94%)	
Surgery or a procedure (past 12 months) (%)	1409 (24.61%)	70 (42.42%)	664 (24.39%)	675 (23.78%)	<.001
Charlson comorbidity index, mean \pm SD	0.68 \pm 1.28	0.69 \pm 1.22	0.70 \pm 1.27	0.67 \pm 1.29	0.626
Experienced sleep difficulties (past 12 months) (%)	1712 (29.90%)	69 (41.82%)	860 (31.59%)	783 (27.58%)	<.001
Experienced depression (past 12 months) (%)	1440 (25.15%)	73 (44.24%)	696 (25.57%)	671 (23.64%)	<.001

BMI, body mass index.

or bariatric surgery with lifestyle changes may be necessary for appropriate patients to achieve better, more satisfying outcomes over the long-term.

The same patterns existed for individuals with T2DM. Namely, among patients with T2DM, satisfaction with WL methods was two times greater in the surgical procedure/prescription users group compared with the self-modification only group, suggesting that the utilization of these medical interventions may be even more important for patients suffering from obesity-related diseases. However, a prior study comparing gastric band surgery and an intensive weight management program among patients with T2DM found similar improvements in quality of life, diabetes control and patient satisfaction between the two

groups (45). Meanwhile, the current study did not collect information on the intensity and compliance of the self-modification WL methods; hence, the differences observed in the current study regarding satisfaction were found to be significantly different between the two groups.

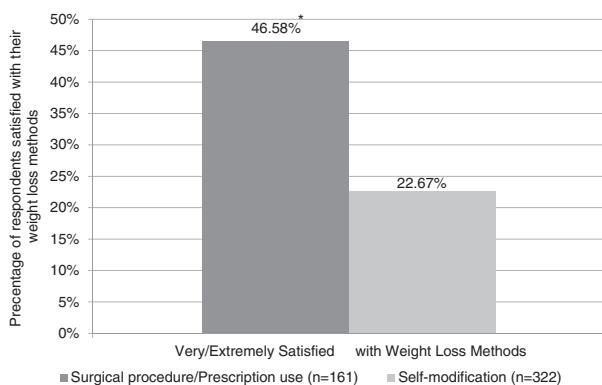
A number of limitations of the current study should be acknowledged. All data from the NHWS are self-reported, so no clinical validation of BMI or comorbidities was available. Data came from a patient survey; therefore, responses are subject to variability in the interpretation of questions and recall bias. A single item was used to measure satisfaction with WL methods with clear a prior cut-points; given that this item has not been validated extensively with respect to this particular use, further research is needed to

Table 5 Weight loss methods among respondents with type 2 diabetes mellitus that are overweight or obese (body mass index ≥ 27)

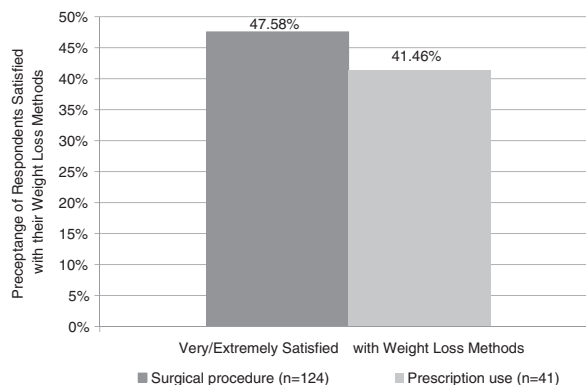
	Total (n = 165)	Surgical procedure (n = 124)	Current prescription (n = 41)	P- Value
Surgical procedure (e.g., gastric bypass surgery, stomach stapling and gastric binding) (%)	95 (57.58%)	95 (76.61%)	0 (0.00%)	N/A
LAP-BAND® system or REALIZE® band procedure (%)	37 (22.42%)	37 (29.84%)	0 (0.00%)	N/A
Weight loss prescription medication (%)	45 (27.27%)	4 (3.23%)	41 (100.0%)	N/A
Over-the-counter weight loss medication (%)	7 (4.24%)	6 (4.84%)	1 (2.44%)	0.509
Weight management program (e.g., Weight Watchers® and Jenny Craig®) (%)	34 (20.61%)	27 (21.77%)	7 (17.07%)	0.519
Diet supplements or foods (e.g., Slim Fast®) (%)	33 (20.00%)	23 (18.55%)	10 (24.39%)	0.418
Diet to lose weight (%)	125 (75.76%)	93 (75.00%)	32 (78.05%)	0.693
Exercise to lose weight	99 (60.00%)	77 (62.10%)	22 (53.66%)	0.339

Table 6 Weight loss methods among propensity matched respondents with type 2 diabetes mellitus that are overweight or obese (body mass index ≥ 27)

	Total (n = 483)	Surgical procedure/prescription use (n = 161)	Self- modification (n = 322)	P- Value
Over-the-counter weight loss medication (%)	30 (6.21%)	7 (4.35%)	23 (7.14%)	0.230
Weight management program (e.g., Weight Watchers® and Jenny Craig®) (%)	80 (16.56%)	33 (20.50%)	47 (14.60%)	0.100
Diet supplements or foods (e.g., Slim Fast®) (%)	111 (22.98%)	31 (19.25%)	80 (24.84%)	0.169
Diet to lose weight (%)	391 (80.95%)	122 (75.78%)	269 (83.54%)	0.041
Exercise to lose weight (%)	308 (63.77%)	96 (59.63%)	212 (65.84%)	0.181

**Figure 3** Proportion of respondents with type 2 diabetes mellitus who were overweight or obese (body mass index ≥ 27) and their satisfaction with weight loss methods. Note: Four respondents in the surgical procedure/prescription use group could not be matched with a respondent in the self-modification group. * $P < 0.001$.

estimate its reliability and validity in relation to satisfaction and existing validated measures in WL. Also, causal directions of influence cannot be demonstrated conclusively on the basis of a cross-sectional survey study such as this, where the influence of unmeasured extraneous variables can be confounded with results. Data on calorie reduction, minutes exercised per week, possible stigmas and time of

**Figure 4** Proportion of respondents with type 2 diabetes mellitus who were overweight or obese (body mass index ≥ 27) and their satisfaction with a surgical procedure vs. prescription medication use for weight loss.

WL procedure were not collected in the current study; therefore, the association of these parameters with WL treatment satisfaction could not be assessed and compared with other published research. The present analysis did not evaluate treatment satisfaction associated with recently approved WL medications because data were not available at the time of analysis. Further research is needed to include newer WL medications and validate these findings with a longitudinal study.

Conclusions

The results from the present study indicate that pharmacotherapy and bariatric surgery should be considered as an integral part of weight management for appropriate patients. This approach may lead to greater treatment satisfaction and help patients achieve and maintain long-term weight loss more effectively.

Conflict of Interest Statement

Shaloo Gupta is an employee of Kantar Health, which conducted National Health and Wellness Survey, and they analysed the data on behalf of, and with funding from, Eisai Inc., including funding for the manuscript publication. Zhixiao Wang is an employee of Eisai Inc., which funded this study.

Author contributions

All authors contributed to the study design, interpretation of results, and review, revision and approval of the final manuscript. Authors have access to the study data supporting this publication.

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