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Review Paper

Long Term Issues of Weight Regain and Inadequate Weight Loss after Bariatric Surgery: Review

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ABSTRACT:
Obesity and its associated co-morbidities is pandemic and with scientific developments, many combating therapies are in prevalence. Bariatric Surgery (BS) is considered most effective treatment for morbid obesity. After the surgery however weight regain can occur in 20-30% cases. It has also been observed that some patients do not achieve successful outcomes of weight loss or even if they do so, they are unable to maintain it. Various factors like food choices, Basal metabolism, energy expenditure, lifestyle modifications and hormonal changes are seen to affect the weight status after surgery. This review study depicts factors as well as the mechanism of weight regain post bariatric surgery. It is imperative that weight gain occurs in patients, therefore, more studies are required towards the prevention and care in these subjects.

Keywords: obesity, bariatric surgery, weight regain

INTRODUCTION:

Obesity is a chronic disease and its associated co-morbidities along with the psychological problems, are major public health concern faced, regardless of the geographical location. According to world Health Organisation (WHO), in 2014, more than 1.9 billion adults were overweight out of which 600 million were obese, worldwide. Thus, it could be summarised that the prevalence of obesity has double between 1980 and 2014. With these rising concerns, in the last 15 years bariatric procedure has risen and shown tremendous result in weight loss and metabolic co-morbidity resolution. Presently an ongoing concern is inadequate weight loss or failure of long term weight maintanence after surgery. It is estimated that 20% of patients fail to achieve satisfactory weight loss or experience a significant weight regain [1]. Weight stability has been defined as ±5 kg weight for both surgical and nonsurgical patients [2]. Weight regain is defined as any increase in weight beyond weight stable range. In surgical cases, success in terms of weight loss is described as 50–75% excess weight loss (% EWL), and achieving a BMI less than 35 kg/m2 [3-9. Regain of 20–25% of the lost weight after bariatric surgery can occur over a period of 10 years [5]. Various factors like metabolism, hormonal adaptation, physical activity level, compliance to a recommendation and patient's knowledge contribute to the present concern. Therefore, purpose of this paper is to review factors and mechanism of weight regain post surgery.

MATERIAL AND METHODS:

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2009 Guidelines (PRISMA) were used to conduct data extraction[200]. We conducted a comprehensive review of all studies published in the English literature containing the parameters of interest and weight regain factors with any form of bariatric surgery. PubMed (www.ncbi.nlm.nih.gov/pubmed) and MEDLINE (http://www.ncbi.nlm. h.gov), databases were searched for articles published from 1985 onwards with the following search terms: "Bariatric Surgery*

[All Fields]," "weight gain* [All Fields]," "factors contributing to weight gain* [All Fields]." Further searches were performed by reviewing abstract booklets and review articles. Relevant articles referenced in these publications were downloaded from the databases and used to widen the search results.

RESULT AND DISCUSSION:

Various factors that determine Weight regain or inadequate weight loss after surgery are:

1. **Energy Expenditure :**

Energy expenditure varies with individual's weight and the level of physical activity performed on daily basis. Resting energy expenditure (REE) and Total energy expenditure (TEE) are important components of weight fluctuation. REE is defined as the energy needed to fuel minimal daily functions of cells and organs (10, 11). Total energy expenditure (TEE) represents a compilation resting metabolic rate, diet-induced thermogenesis, and activity-related energy expenditure (12). Weight loss leads to a decrease in REE (13), which accounts for approximately 60 percent of TEE in humans (14). Following weight loss, a decrease in REE is thought to lead to weight regain (15), suggesting vicious cycle of obesity.

2. **Nutrient Metabolism:**

REE and weight regain is influenced by diet composition used for weight loss. Macro molecules like carbohydrate, protein, and fat stimulate oxygen consumption differently, which may influence changes in weight (13). Energy restriction involves a shift in metabolism which favours lipid oxidation over carbohydrate, and therefore a low carbohydrate diet or a diet that has complex carbohydrate distribution may protect against weight regain (16,17).

2. **Hormonal Adaptations:**

Through many studies, it has been shown that energy homeostasis is maintained by an array of complex pathways. Meal anticipation and food presence stimulates the release of certain hormones that play major role in weight loss and its maintenance(19). There are a group of countering hormones where few supresses appetite and few stimulate it. The two stimulatory hormones are insulin and ghrelin. Insulin is synthesized in the β cells of the pancreas and secreted rapidly after a meal, with well-characterised hypoglycaemic effects (34).Ghrelin is an orexigenic gut hormone that is known to increase food intake and thereby weight. Fasting plasma levels of ghrelin are high in patients with anorexia nervosa [108] and in subjects with diet-induced weight loss(187). A study shows that, obese subjects display a less marked drop in plasma ghrelin after meal (32).

Antagonistic to the above two are Glucagon-Like Peptide-1(GLP-1), Glucagon-Like Peptide-1(GLP-2), Oxyntomodulin (OXM), and glucagon. GLP-1 and Peptide Tyrosine Tyrosine (PYY) are associated in response to nutrient intake, GLP-1 levels rise after a meal and falls in fasted state and also its level is seen to rise in anticipation of a meal. GLP-1 reduces food intake, suppresses glucagon secretion, and delays gastric emptying (20). Ingestion of fat results in greater release of PYY as compared to carbohydrate or protein meals with a similar calorie content (25), suggesting that, the sensitivity of PYY is preserved in obese patients (26,27). Pancreatic polypeptides (PP) an anorectic hormone is secreted from PP cells in the pancreatic islets of Langerhans. In a study it was shown that, intravenous infusion of PP in healthy humans results in a 25% reduction in food intake (21). Furthermore, twice-daily infusion of PP in Prader willi Syndrome (PWS) patients caused a 12% reduction in food intake(22). Oxyntomodulin (OXM) is released from L-cells of the intestine in response to ingested food and in proportion to caloric intake [28]. Administration of OXM reduces food intake and increases energy expenditure in both rodents and humans (29,30,31). Leptin administration alleviates hyperphagia associated with congenital leptin deficiency. However, obese subjects are resistant to leptin, which may account for its lack of effectiveness in such individuals (35,36).

4. **GI Motility:**

Verdich et al (2000), examined the time course of gastric emptying following weight loss (37) and suggested that, there is delay in release of satiety hormones in gut that promotes feeding. In similar studies with gastric bypass patients , it was shown that increased transit time through stomach is the hallmarks of gastric bypass. Importantly, postprandial levels of the gut-derived satiety hormones are increased in gastric bypass patients as compared to restrictive procedures (38-41). These findings focus on the role of gastric emptying in weight regain.

5. **Drivers to Eat:**

There are multiple drivers that affect hunger, appetite and satiety, and influence our eating behaviour. **Chapman et al** (2012), identified television watching, alcohol intake, and sleep deprivation as drivers to eat in healthy individuals (42). Each behaviour was linked to dis-inhibition resulting in less restrictive food consumption and weight gain. Higher levels of disinhibition and its increase over a year is a significant

predictors of weight regain in both surgical and nonsurgical participants (43). In a study RYGB patients (>1.5 years post op) with weight regain post weight loss reported a return of similar pre-surgical eating behaviours, such as increased hunger, difficulty in coping with food cravings, and eating energy dense foods (44). A greater percentage of surgical individuals (compared to nonsurgical) reported night eating at least one time per week, and this in would have later contributed to weight regain (43).

6. **Errors in Estimating Intake:**
Self monitoring is important to help support patients with weight management. Patients express great frustration when they follow the prescribed dietary instructions but are unable to achieve expected outcome. Under-reporting of intake can be in two forms ie intentional and unintentional factors. Intentional factors may include not reporting foods usually consumed, not reporting foods consumed that are not consistent with their diet plan, or not reporting foods that the patient considers "hostile" or "bad" (i.e., sweets or fried food etc). Unintentional factors may include a lack of recording foods due to infrequency of intake or having a genuine lack of recall (i.e., forgetting snacks, beverages)(45,46). It is vital to discuss with patient the inherent errors with self reporting. Calculations of the reported intake of food need to be discussed in context of these errors, which would eventually help patients improve their daily estimations. To improve accuracy, dietitians can work with patients to find self monitoring tools that best suits their needs, improve estimation of portions, teach patients how to accurately measure food portions, and also help patients access accurate sources for nutrition information. Repitition is the key, where the diet team can help patients use a particlar tool again and again and almost develp it so that it becomes the habbit of patient.

7. **Adherence/Compliance failure:**
Adherence to recommendations is vital for any intervention to be successful. BS can present many challenges impacting a patient's nutritional behaviour as it is difficult to comprehend and adhere to all recommendations. Although followup is recommended, adherence to post-surgery visits is low with most centers. In a study, 782 RYGB patients were followed over 5 years. At the end of 4 years iw was observed that, data was available for only 60% of these patients and out of that percentage population, 64% experienced weight regain. Of those patients that experienced weight regain, 60% never had nutritional follow up and 80% never underwent psychological followup (47). Later, the study also stated that nutrition counseling was effective in reducing the total body weight and body fat of RYGB patients (2 years post-op) with weight regain as per a study done by **Faria et al**. (48). Therefore, adherence with self monitoring behaviour decreases likelihood of weight regain (50).

8. **Food and Beverage Choices:**
Although bariatric surgery provides restriction to help limit food portions, patients are more likely to consume high calorie food after surgery. Two important factors that leads to high calorie consumption in beverages are, unawareness about the actual calorie content of that beverage as well as unable to attain satiety after its consumption. Hence, compensation at the next meal does not occur, as a result patients tend to consume more (50). In a study, replacement of caloric beverages with water or calorie-free beverages resulted in a weight loss of 2–2.5% in obese subjects(49).

9. **Patient Knowledge**
There are various sources of information like health care providers, family, friends, electronic media, internet, etc, accuracy of which vary. Patients must be taught about the new changes seen, adoption of which can help them. They should also be taught about the ill effects of smoking and alcoholism post surgery. They should be made aware of the various side effects and complications associated with the surgery, so that they are well prepared to it.

10. **Body's Adaptation:**
Body adaptation is a process in which body gets accostomed to same food and exercise routine. It is a mechanism by which body biologically tries to avoid changes. Moreover with the same food body cant get all essential nutrients which can boosts metabolism. Therefor, its advised to include variety (both diet & physical activity) is a key to boost up body metabolism.

11. **Nutritional Deficiencies:**
Nutritional deficiency leads to food craving & fatigue. Low nutrient levels in the appetite center of the brain can trigger a ravenous appetite and uncontrollable cravings-especially for tasty, high calorie foods that cause excessive weight gain. Similarly, fatigue limits physical activity. Furthermore, Lack of essential vitamin and minerals, tends to slow metabolism which is likely to contribute to progressive unwanted weight gain. Few studies (51,52) found obesity to be associated with lower 25D concentrations, high parathyroid hormone (PTH) concentrations and low 1,25 D concentrations. It has also been reported in a study, that body fat content is inversely related to serum 25D concentration, and that

this associations is stronger than those between 25D and BMI and body weight (53).

CONCLUSION:

Obesity is prevalent. Bariatric surgery with education and support programme can deliver weight loss and maintenance, with sustained health benefits like Diabetes, Hypertension, Obstructive sleep apnoea, psoriasis, and dyslipidemia. The weight loss outcome of surgery is usually favorable in short term but weight regain is seen to occur after 2 years. Factors leading to poor results of weight loss or weight regain are change in metabolism, gut hormone regulation, wrong food choices and estimation and inadequate physical activity levels. he data on role of Psychological functioning in a post bariatric patient is lacking which ought to play a significant role. Many attempts of maintenance like revision surgery, endoscopic plasma argon coagulation treatment are in process. However, a constant follow up with the doctors and nutrition experts are imperative.

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REFERENCES:

- Brolin RE. Bariatric surgery and long-term control of morbid obesity. JAMA 2002;288:2793–6, Elder KA, Wolfe BM. Bariatric surgery: a review of procedures and outcomes. Gastroenterology 2007;132:2253–71, Magro DO, Geloneze B, Delfini R, et al. Long-term weight regain after gastric bypass: a 5-year prospective study. Obes Surg 2008;18: 648–51, Christou NV, Look D, Maclean LD. Weight gain after short- and long-limb gastric bypass in patients followed for longer than 10 years. Ann Surg 2006;244:734–40.
- G. Camps, S. P. Verhoef, and K. R. Westerterp, "Weight loss, weight maintenance, and adaptive thermogenesis," American Journal of Clinical Nutrition, vol. 97, no. 5, pp. 990–994, 2013. View at Publisher· View at Google Scholar, D. S. Bond, S. Phelan, T. M. Leahey, J. O. Hill, and R. R. Wing, "Weight-loss maintenance in successful weight losers: surgical versus non-surgical methods," International Journal of Obesity, vol. 33, no. 1, pp. 173–180, 2009. View at Publisher · View at Google Scholar · View at Scopus
- Sjostr ¨ om, A. K. Lindroos, M. Peltonen et al., "Lifestyle, dia- ¨ betes, and cardiovascular risk factors 10 years after bariatric surgery," New England Journal of Medicine, vol. 351, no. 26, pp. 2683–2693, 2004.
- Sjostr ¨ om, K. Napbro, D. Sj ¨ ostr ¨ om et al., "Effects of bariatric ¨ surgery on mortality in Swedish obesity subjects," The New England Journal of Medicine, vol. 357, no. 8, pp. 753–761, 2007.
- Heber, F. L. Greenway, L. M. Kaplan, E. Livingston, J. Salvador, and C. Still, "Endocrine and nutritional management of the post-bariatric surgery patient: an endocrine society clinical practice guideline," Journal of Clinical Endocrinology and Metabolism, vol. 95, no. 11, pp. 4823–4843, 2010.
- Romy, A. Donadini, V. Giusti, and M. Suter, "Roux-en-Y gastric bypass versus gastric banding for morbid obesity," Archives of Surgery, vol. 147, no. 5, pp. 460–466, 2012.
- I. Mechanick, R. F. Kushner, H. J. Sugerman et al., "AACE/ TOS/ASMBS guidelines: American Association of Clinical Endocrinologists, the Obesity Society, and American Society for Metabolic & Bariatric Surgery Medical guidelines for clinical practice for the perioperative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient," Obesity, vol. 17, supplement 1, pp. S1–S70, 2009.
- V. Christou, M. Lieberman, F. Sampalis, and J. S. Sampalis, "Bariatric surgery reduces cancer risk in morbidly obese patients," Surgery for Obesity and Related Diseases, vol. 4, no. 6, pp. 691–695, 2008.
- A. Maggard, L. R. Shugarman, M. Suttorp et al., "Meta-analysis: Surgical treatment of obesity," Annals of Internal Medicine, vol. 142, no. 6, pp. 547–559, 2005.

(10) D. S.Weigle, "Appetite and the regulation of body composition," The FASEB Journal, vol. 8, no. 3, pp. 302–310, 1994.

(11)D. X. Cao, G. H. Wu, B. Zhang et al., "Resting energy expenditure and body composition in patients with newly detected cancer," Clinical Nutrition, vol. 29, no. 1, pp. 72–77, 2010.

(12) G. Plasqui and K. R. Westerterp, "Seasonal variation in total energy expenditure and physical activity in Dutch young adults," Obesity Research, vol. 12, no. 4, pp. 688–694, 2004

(13) G. A. Bray, S. R. Smith, L. DeJonge et al., "Effect of diet composition on energy expenditure during weight loss: the POUNDS LOST study," International Journal of Obesity, vol. 36,no. 3, pp. 448–455, 2012.

(14) R. L. Leibel, M. Rosenbaum, and J. Hirsch, "Changes in energy expenditure resulting from altered body weight," The New England Journal of Medicine, vol. 332, no. 10, pp. 621–628, 1995.
(15) C. B. Ebbeling, J. F. Swain, H. A. Feldman et al., "Effects of dietary composition on energy expenditure during weight-loss maintenance,"The Journal of theAmericanMedical Association, vol. 307, no. 24, pp. 2627–2634, 2012.
(16) P. S.MacLean, J. A.Higgins, G. C. Johnson, B. K. Fleming-Elder, J. C. Peters, and J. O. Hill, "Metabolic adjustments with the development, treatment, and recurrence of obesity in obesityprone rats," American Journal of Physiology, vol. 287, no. 2, pp. R288–R297, 2004. 6 ISRN Obesity
(17) S. J. Caton, B. Yinglong, L. Burget, L. J. Spangler,M. H. Tsch¨op, and M. Bidlingmaier, "Low-carbohydrate high-fat diets: regulation of energy balance and body weight regain in rats," Obesity, vol. 17, no. 2, pp. 283–289, 2009.
(18) D. E. Cummings, D. S. Weigle, R. Scott Frayo et al., "Plasma ghrelin levels after diet-induced weight loss or gastric bypass surgery," New England Journal of Medicine, vol. 346, no. 21, pp. 1623–1630, 2002.
(19)T. P. Vahl, D. L. Drazen, R. J. Seeley, D. A. D'Alessio, and S. C. Woods, "Meal-anticipatory glucagon-like peptide-1 secretion in rats," Endocrinology, vol. 151, no. 2, pp. 569–575, 2010.
(20) D. E. Cummings and J. Overduin, "Gastrointestinal regulation of food intake," Journal of Clinical Investigation, vol. 117, no. 1, pp. 13–23, 2007.
(21)R. L. Batterham, C. W. Le Roux, M. A. Cohen et al., "Pancreatic polypeptide reduces appetite and food intake in humans," Journal of Clinical Endocrinology and Metabolism, vol. 88, no. 8, pp. 3989–3992, 2003.
(22) G. G. Berntson, W. B. Zipf, T. M. O'Dorisio, J. A. Hoffman, and R. E. Chance, "Pancreatic polypeptide infusions reduce food intake in Prader-Willi syndrome," Peptides, vol. 14, no. 3, pp. 497–503, 1993.
(23) J. J. Holst, "On the physiology of GIP and GLP-1," Hormone and Metabolic Research, vol. 36, no. 11-12, pp. 747–754, 2004.
(24) M. Tang-Christensen, N. Vrang, and P. J. Larsen, "Glucagonlike peptide containing pathways in the regulation of feeding behaviour," International Journal of Obesity, vol. 25, supplement 5, pp. S42–S47, 2001.
(25) T. E. Adrian, G. L. Ferri, and A. J. Bacarese-Hamilton, "Human distribution and release of a putative new gut hormone, peptide YY," Gastroenterology, vol. 89, no. 5, pp. 1070–1077, 1985.
(26) R. L. Batterham, M. A. Cowley, C. J. Small et al., "Gut hormone PYY3-36 physiologically inhibits food intake," Nature, vol. 418, no. 6898, pp. 650–654, 2002.
(27) R. L. Batterham, M. A. Cohen, S. M. Ellis et al., "Inhibition of food intake in obese subjects by peptide YY3-36," New England Journal of Medicine, vol. 349, no. 10, pp. 941–948, 2003
(28) M. A. Ghatei, L. O. Uttenthal, and N. D. Christofides, "Molecular forms of human enteroglucagon in tissue and plasma: plasma responses to nutrient stimuli in health and in disorders of the upper gastrointestinal tract," Journal of Clinical Endocrinology and Metabolism, vol. 57, no. 3, pp. 488–495, 1983.
(29) M. A. Cohen, S. M. Ellis, C.W. Le Roux et al., "Oxyntomodulin suppresses appetite and reduces food intake in humans," Journal of Clinical Endocrinology and Metabolism, vol. 88, no.
10, pp. 4696–4701, 2003.
(30) C. L. Dakin, I. Gunn, C. J. Small et al., "Oxyntomodulin inhibits food intake in the rat," Endocrinology, vol. 142, no. 10, pp. 4244–4250, 2001.
(31) K. Wynne, A. J. Park, C. J. Small et al., "Oxyntomodulin increases energy expenditure in addition to decreasing energy intake in overweight and obese humans: a randomised controlled trial," International Journal of Obesity, vol. 30, no. 12, pp. 1729–1736, 2006.
(32) C. W. Le Roux, M. Patterson, R. P. Vincent, C. Hunt, M. A. Ghatei, and S. R. Bloom, "Postprandial plasma ghrelin is suppressed proportional to meal calorie contentb in normal-weight but not obese subjects," Journal of Clinical Endocrinology and Metabolism, vol. 90, no. 2, pp. 1068–1071, 2005
(33) D. E. Cummings, K. Clement, J. Q. Purnell et al., "Elevated plasma ghrelin levels in Prader-Willi syndrome," Nature Medicine, vol. 8, no. 7, pp. 643–644, 2002.
(34) K. S. Polonsky, B. D. Given, and E. Van Cauter, "Twenty-fourhour profiles and pulsatile

patterns of insulin secretion in normal and obese subjects," Journal of Clinical Investigation, vol. 81, no. 2, pp. 442–448, 1988.
(35) I. S. Farooqi, S. A. Jebb, G. Langmack et al., "Effects of recombinant leptin therapy in a child with congenital leptindeficiency," New England Journal of Medicine, vol. 341, no. 12, 879–884, 1999.
(36) P. M. J. Zelissen, K. Stenlof, M. E. J. Lean et al., "Effect of three treatment schedules of recombinant methionyl human leptin on body weight in obese adults: a randomized, placebo controlled trial," Diabetes, Obesity and Metabolism, vol. 7, no. 6, pp. 755–761, 2005.
(37)C. Verdich, J. L. Madsen, S. Toubro, B. Buemann, J. J. Holst, and A. Astrup, "Effect of obesity and major weight reduction on gastric emptying," International Journal of Obesity, vol. 24, no. 7, pp. 899–905, 2000
(38) T. C. M. Adam, J. Jochan, and M. S. Westerterp-Plantenga, "Decreased glucagon-like peptide 1 release after weight loss in overweight/obese subjects," Obesity Research, vol. 13, no. 4, pp. 710–716, 2005.
(39) P.A. Essah, J.R. Levy, S. N. Sistrun, S.M.Kelly, and J. E. Nestler, "Effect of weight loss by a low-fat diet and a low-carbohydrate diet on peptide YY levels," International Journal of Obesity, vol. 34, no. 8, pp. 1239–1242, 2010
(40) B. Oliv´an, J. Teixeira, M. Bose et al., "Effect of weight loss by diet or gastric bypass surgery on peptide YY3−36 levels," Annals of Surgery, vol. 249, no. 6, pp. 948–953, 2009.
(41) B. Laferr`ere, J. Teixeira, J. McGinty et al., "Effect of weight loss by gastric bypass surgery versus hypocaloric diet on glucose and incretin levels in patients with type 2 diabetes," Journal of Clinical Endocrinology and Metabolism, vol. 93, no. 7, pp. 2479–2485, 2008
(42) D. S. Bond, S. Phelan, T. M. Leahey, J. O.Hill, and R. R.Wing, "Weight-loss maintenance in successful weight losers: surgical versus non-surgical methods," International Journal of Obesity, vol. 33, no. 1, pp. 173–180, 2009.
(43) C. Chapman, C. Benedict, S. Brooks, and H. Schioth, "Lifestyle determinants of the drive to eat: a meta-analysis," American Journal of Clinical Nutrition, vol. 96, no. 3, pp. 492–497, 2012.
(44) K. E. Stewart, M. E. Olbrisch, and M. K. Bean, "Back on track: confronting post-surgical weight gain," Bariatric Nursing and Surgical Patient Care, vol. 5, no. 2, pp. 179–185, 2010.
(45)B. L. Heitmann and L. Lissner, "Dietary underreporting by obese individuals—is it specific or non-specific?" British Medical Journal, vol. 311, no. 7011, pp. 986–989, 1995.
(46) J. Macdiarmid and J. Blundell, "Assessing dietary intake: who, what and why of under-reporting," Nutrition Research Reviews, vol. 11, no. 2, pp. 231–253, 1998.
(47) D.O.Magro, B.Geloneze, R.Delfini, B. C. Pareja,F.Callejas, and J. C. Pareja, "Long-term weight regain after gastric bypass: a 5- year prospective study," Obesity Surgery, vol. 18, no. 6, pp. 648–651, 2008.
(48) S. L. Faria, E. De Oliveira Kelly, R. D. Lins, and O. P. Faria, "Nutritional management of weight regain after bariatric surgery," Obesity Surgery, vol. 20, no. 2, pp. 135–139, 2010.
(49) D. F. Tate, G. Turner-McGrievy, E. Lyons et al., "Replacing caloric beverages with water or diet beverages for weight loss in adults:main results of the ChooseHealthyOptions Consciously Everyday (CHOICE) randomized clinical trial," American Journal of Clinical Nutrition, vol. 95, no. 3, pp. 555–563, 2012.
(50) J. Odom, K. C. Zalesin, T. L. Washington et al., "Behavioral predictors of weight regain after bariatric surgery," Obesity Surgery, vol. 20, no. 3, pp. 349–356, 2010.