THE IMPACT OF PSYCHOSOCIAL OUTCOMES IN LONG-TERM BARIATRIC PATIENTS

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

DOCTOR OF PHILOSOPHY

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ABSTRACT

The disease of obesity is a serious and significant public health epidemic affecting more than 78 million Americans. The increase in human life expectancy also increases the chance of reduced quality of life and well-being by those suffering from obesity. Obesity–related factors may mean years of physical and psychosocial discomfort, lack of mobility, and chronic ill health. This study analyzed long-term bariatric patient outcomes, specifically, factors regarding post-procedure weight regain, surgeon follow-up, and psychosocial issues related to quality of life (i.e. self-concept and obesity discrimination). The overarching research design for this study employed survey methods, using a cross-sectional, self-reported questionnaire and enlisted both a combined quantitative and qualitative approach to analyze data. Participants over the age of 18 and at least 18-months post-procedure were recruited either from public bariatric support forums (n = 133) or through a regional weight management center in the Midwest (n = 534), which specializes in bariatric surgery. Results suggests that although some weight regain after surgery is likely, weight regain decreases as a patient continues to maintain adherence to the recommended post-operative diet, as well as the importance of bariatric follow-up and support. Additional results revealed that different aspects regarding the 'self' such as body image, the continued struggle to develop alternative coping strategies to eating, and obesity stigma have an impact for a multitude of years post-bariatric surgery, and therefore can overshadow the benefits of surgery. It is recommended that a critical key to success for long-term bariatric patients is having access and care of multidisciplinary teams including a bariatric surgeon, gastro-intestinal specialist, endocrinologist, nutritionist, and psychiatrist at minimum. Finally, there is also a significant need for long-term bariatric research in the future.

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DEDICATION

This dissertation is dedicated to my mother and grandmother-- the women who shaped me into the woman I am today, and together, embody the woman I strive to become tomorrow. Your unwavering love, encouragement, and support of my never ending quest for knowledge knows no boundaries.

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CHAPTER I. INTRODUCTION

The prevalence of obesity in older adults is rapidly expanding due to the aging of the baby boomer generation. Estimates of obesity in older Americans, increased from 9.9 million (24%) in 1990 to 14.6 million (32%) in 2000 to an estimated 22.2 million (37%) in 2010 (Salihu, Bonnema, & Alio, 2009). Since the baby boomers, defined as those born between 1946-1964, are reaching their sixth decade heavier than previous generations, there is a public health concern that these overweight adults will become obese, leading to greater risk of chronic disease (Leveille, Wee, & Iezzoni, 2005). The baby boomers were more overweight and became obese at younger ages than previous generations (Zevin, Aggarwal, & Grantcharov, 2012). When the silent generation members, defined as those born between 1926-1945, were aged 35-44 years, 14 to 18% were obese, but when the baby boomers were in that age range, those percentages doubled to 28-32% (Zevin et al., 2012).

Bariatric surgery is now the leading treatment for long-term weight loss (Grimaldi & Van Etten, 2010). The word *bariatric* comes from the Greek word *baros* meaning burden or heavy. Bariatric surgery includes several procedures designed to reduce food intake and cause weight loss for individuals who failed to lose weight through diet and exercise (Karmali et al., 2010). Bariatric surgery has various advanced options available. These options range from less invasive and generally reversible procedures, such as laparoscopic adjustable gastric banding (LAGB), to more invasive, procedures such as Roux-en-Y gastric bypass (RYGB) and biliopancreatic diversion with duodenal switch (BPD-DS). Each has its risks, side effects, and benefits, which need careful consideration when choosing a procedure that is a best match for the patient.

Effects of Obesity

With the increased obesity rates for older adults, increased life expectancy does not necessarily mean an increase in healthy years (Han, Tajar, & Lean, 2011). Instead, obese elderly may be facing additional years of discomfort, lack of mobility, and chronic ill health (Mathus-Vliegen, 2012; Mathus-Vliegen et al., 2012). The most common obesity related chronic diseases are type II diabetes, hypertension, heart disease, stroke, certain types of cancers, metabolic syndrome, respiratory disease, sleep apnea, fatty liver disease, osteoarthritis, gall bladder disease, pulmonary embolism, gastro-esophageal reflux disease (GERD), urinary incontinence, chronic renal failure, gout, and depression (Zamosky, 2013).

Obesity creates far-reaching problems, not only for the obese person, but also for family members and the whole of society. For individuals, obesity increases psychological problems, lowers sleep quality, and decreases one's quality of life (Algul et al., 2009; Hopman et al., 2007; Wee et al., 2008). Obesity is also associated with increased mortality and reduced life expectancy as a result of increased medical risks (de Beer et al., 2007; Maggard et al., 2005; Padwal, 2005; Sach et al., 2007). Many obese people may struggle with physical mobility as a result of their weight, and problems can be greatly exacerbated.

Social Costs of Obesity

The psychological effects of obesity are equally significant and include lowered self-esteem, depression, anxiety, social withdrawal, and loneliness (Greenberg, Sullivan, Kaplan, & Perna, 2005; Huberman, 2008). In addition to the physical and psychological effects of obesity on individuals, obesity is also a societal concern because of rising health care and employer costs due to missed days at work for obesity-related issues (Bachman, 2007; Roehling, 1999). The many negative effects of obesity led researchers and healthcare professionals to search for

effective weight loss treatments. Most diets and behavioral treatments resulted in initial weight loss, only to be followed by weight regain (Huberman, 2008) leading healthcare providers to turn to surgical treatments for obesity (Karmali et al., 2010).

Reports on the psychological consequences of obesity experienced by certain individuals include lower self-esteem, depression, and anxiety. Obese individuals are three to four times more likely to report depression and anxiety than non-obese individuals (Greenberg et al., 2005). Many obese people experience discrimination, loneliness, and shame resulting from their weight battles (Greenberg et al., 2005). This may lead to social withdrawal and loneliness, which increases negative outcomes related to quality of life. Obese individuals often experience increased psychological issues related to work-related psychosocial stress such as discrimination at work (Greenberg et al., 2005). Roehling (1999) conducted an exhaustive literature review in which numerous work-related stereotypes were identified in obese patients, such as lack of self-discipline, laziness, sloppy appearance, disagreeableness, slower rates of thinking, and reduced conscientiousness. This is not isolated research as other researchers report similar findings (Puhl, Andreyeva, & Brownell, 2008; Puhl & Heuer, 2009; Schafer & Ferraro, 2011).

From the broader social perspective, obesity is associated with increased health care costs (Bachman, 2007). According to Williams (2009), obesity costs U.S. employers an estimated $12.7 billion annually, and healthcare costs for obese employees are 36% greater than for normal weight workers. The indirect costs to employers include decreased productivity along with increased absenteeism. Obese employees are twice as likely to be absent two weeks or more per year.

Obesity Discrimination

Many obese individuals suffer discrimination in numerous facets of their daily lives. Obesity discrimination plays a role in everyday life, including work, school, and healthcare settings (Puhl & Heuer, 2009). It remains a socially acceptable form of prejudice in American society, and is rarely challenged. In addition, as with other forms of discrimination, obesity discrimination may have consequences for physical health (Muennig, 2008; Schafer & Ferrarro, 2011).

Individuals cope with discriminatory experiences in a number of ways. Growing literature links weight bias with a number of coping behaviors, including problematic eating (Puhl et al., 2008; Puhl & Heuer, 2009; Manzoni, Castelnuovo, Villa, Pietrabissa, & Molinari, 2013) and avoidance of physical activity (Niego, Kofman, Weiss, & Geliebter, 2007). Adults who believe the negative stereotypes of obesity are more likely to refuse to diet and engage in binge eating behaviors (Puhl et al., 2008). Thus, one coping mechanism for individuals who experience weight discrimination is to engage in the behaviors that are conducive to obesity. Weight discrimination, which is often justified because it is thought to help encourage obese individuals to lose weight (Puhl & Heuer, 2010), can actually have the opposite effect, since it is associated with the development and maintenance of obesity. Such discrimination is one social determinant of health that may contribute to numerous inequalities within daily lives.

Obesity Treatment

Obesity is very difficult to treat with lifestyle changes, yet the medical community continues to encourage people to lose weight by traditional diet and exercise methods (Zamosky, 2013). Approaches to weight loss have included self-help groups, drugs, exercise programs, psychotherapy, nutritional counseling, education programs, and surgery (Wadden, Wilson,

Stunkard, & Berkowitz, 2011). As a result of these recommendations, overweight and obese people attempt multiple diets, medications, and exercise regiments which tend to have limited long-term results (Dorman & Abraham, et al., 2012; Neff, Olbers, & Le Roux, 2013; Zamosky, 2013). Increasingly, a viable option for obese patients has been surgery as a means to aid weight loss (Han et al., 2011; Mathus-Vliegen, 2012; Zamosky, 2013; Zevin et al., 2012). Bariatric surgery that either restricts caloric intake or absorption has been found as the most effective method to lose weight and maintain a healthy lifestyle (Mathus-Vliegen et al., 2012; Zamosky, 2013; Zevin et al., 2012).

Types of Bariatric Surgery

There are various bariatric procedures available (Neff et al., 2013) and generally, the more complex the procedure, the greater the weight loss. But more complex/extensive surgery also has greater complications with higher morbidity and mortality rates (Dorman et al., 2012). The order of surgical frequency is: Roux-en-Y gastric bypass (RYGB), laparoscopic adjustable gastric banding (LAGB), and vertical sleeve gastrectomy (VSG). Biliopancreatic diversion with a duodenal switch (BPD-DS) is the least commonly performed surgery type, but is often considered for super, morbidly obese individuals, which is defined as > 50 kg/m2. (Neff et al., 2013).

Roux-en-Y gastric bypass (RYGB). RYGB is the most common type of weight loss surgery worldwide and is considered permanent (Buchwald & Oien, 2013). The stomach is divided into two sections, the upper part is a small pouch which holds about 1-2 ounces of food initially (Buchwald & Oien, 2013). The pouch is connected to the jejunum using a Y-shaped limb of the small intestine bypassing the duodenum (Smith, Schauer, & Nguyen, 2011). Gastric and pancreatic secretions, as well as bile mix with chime at the juncture of the jejunum and the

duodenum (Smith et al., 2011). This procedure permanently changes how food is digested resulting in fewer absorbed calories and micro-nutrients (Perry, Hutter, Smith, Newhouse, & McNeil, 2008). Weight loss is swift and dramatic, usually 50% of excess weight loss (EWL) is in the first six months post-surgery, but may continue for up to two years (Scott & Batterham, 2011). Long-term RYGB results show many patients keep weight off for 10 years or longer (Sjöström et al., 2012). As an added benefit of the rapid weight loss, health conditions affected by obesity such as diabetes, high blood pressure, high cholesterol, arthritis, sleep apnea, heartburn, and other conditions often improve quickly (Chakravarty et al., 2012; Jáuregui-Lobera, 2013; Perry et al., 2008; Poirier et al., 2011).

Nevertheless, challenges with RYGB include impairment of the body's ability to absorb calories, thus dramatically increasing the risk for nutrient deficiencies (Neovius et al., 2012). The most common nutrient deficiencies after RYGB include the vitamins thiamin, B-12, and D, and the minerals iron, copper, and calcium (Adams et al., 2012). Deficiencies of these nutrients can lead to anemia, fatigue, and osteoporosis; therefore, RYGB patients should plan to take vitamin and mineral supplements the rest of their lives (Jáuregui-Lobera, 2013; Saltzman & Karl, 2013). Thiamin deficiency has occurred after all bariatric procedures and can present within weeks or years after surgery (Saltzman & Karl, 2013). Thiamin deficiencies after bariatric surgery can mimic those symptoms as a result of alcoholism. Wernicke's encephalopathy, usually associated with alcoholism, is related to severe thiamin deficiency resulting in cognitive dysfunction and eye disorders such as nystagmus and ocular palsies (Saltzman & Karl, 2013). Vitamin B-12 deficiency results from an intolerance to animal protein after RYGB and lack of intrinsic factor; therefore, monthly B-12 injections are recommended (Saltzman & Karl, 2013). Vitamin D deficiency is a problem for 25% to 75% of bariatric patients with many having this deficiency

pre-operatively. Calcium absorption appears to be diminished possibly due to bypassing the duodenum and lack of vitamin D (Saltzman & Karl, 2013). Resolving an iron deficiency after RYGB can be complicated because oral supplements are not absorbed; therefore, iron must be given intravenously (Saltzman & Karl, 2013). Copper deficiency may also present after RYGB and secondary to iron deficiency; copper status should be investigated as a source of anemia unresponsiveness to other nutrients (Saltzman & Karl, 2013).

RYGB is associated with other side effects such as an increased risk of dumping syndrome in which food is "dumped" from the stomach into the small intestine too quickly before it has been adequately digested (Adams et al., 2012; Hammer, 2012; Myers et al., 2012). Typically, this occurs when eating too many simple carbohydrates which can lead to diarrhea (Heinlein, 2009). Another long-term complication after RYGB is bone loss, which is generally more severe than with nonsurgical methods of weight loss (Berarducci, 2007; Hammer, 2012). Other potential risks include an increased incidence of hernias and gallstone formations. Both can develop post-surgery and require surgical intervention to repair (Adams et al., 2012). Finally, there is a 1% mortality rate with the RYGB surgery (Benotti et al., 2013). Figure 1 presents the four most common types of bariatric surgery.

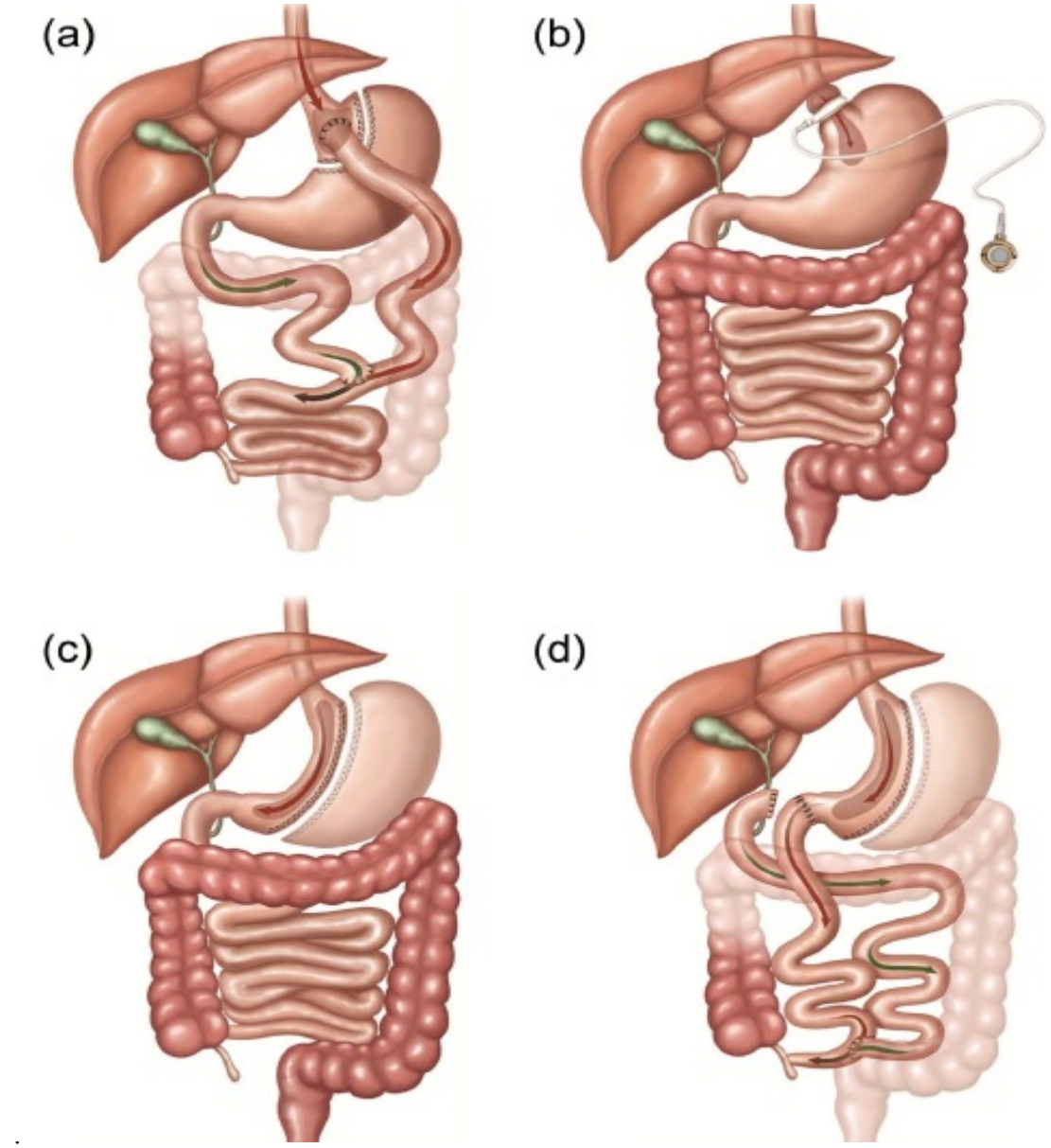

Figure 1.1. Most Common Types of Bariatric Surgery. (Neff et al., 2013)
Note: (a) is Roux-en-Y gastric bypass, (b) is laparoscopic adjustable gastric banding (LAGB), (c) is vertical sleeve gastrectomy (VSG) and (d) is Biliopancreatic diversion, with a duodenal switch.

Laparoscopic adjustable gastric banding (LAGB). LAGB is considered the least invasive surgery and is generally safer than gastric bypass (Angrisani, Lorenzo, & Borrelli, 2007). Benefits of undergoing LAGB are a quicker recovery, shorter hospital stay, and the surgery can usually be reversed (Angrisani et al., 2007; Chakravarty et al., 2012; Neff et al.,

2013; Tice, Karliner, Walsh, Petersen, & Feldman, 2008). LAGB uses an inflatable silicone elastic band to squeeze the stomach into two sections: a smaller upper pouch and a larger lower section. The two sections are still connected, however, the channel or "bottleneck" between them is very small which slows down the emptying of the upper pouch (Tice et al., 2008). Because LAGB physically restricts the amount of food consumed, it is usually a successful method in losing weight. However, weight loss is less dramatic and furthermore, weight is more likely regained over time (Thornton, Rozen, So, Kaplan, & Wilkinson, 2009). A common side effect of LAGB is vomiting which is often a result of eating too much too quickly (Chakravarty et al., 2012). If the band is too tight, acid reflux can result (Scott & Batterham, 2011; Spivak, Abdelmelek, Beltran, Ng, & Kitahama, 2012). Complications with the band itself include slipping out of place, becoming loose, or leaking (Thornton et al., 2009). Sometimes further laparoscopic surgeries are necessary to re-position the band or repair a band leak. Follow-up visits are also required in order to "tighten or loosen" the band to fine-tune how fast food empties from the upper pouch into the residual stomach (Allen, 2007). The process can result in weight fluctuations. LAGB has a 50% failure rate in the long-term, as defined by poor weight loss and percentage of band removal (Spivak et al., 2012). Reasons for band removal range from inadequate weight loss (76%) to gastric pouch dilation (64%) to intolerance (21%) and band slippage (12%) (Spivak et al., 2012).

Vertical sleeve gastrectomy (VSG). About 75-85% of the stomach is surgically removed in the irreversible VSG procedure, which is generally performed laprascopically (Scott & Batterham, 2011). What remains of the stomach is a narrow tube or sleeve, which provides for the normal process of stomach-emptying and the pyloric valve remains intact. Not only is the appetite reduced, but also consuming very small amounts of food generate early and lasting

satiety (Benaiges et al., 2011). Because the small intestine is unchanged (not shortened), VSG does not usually affect the absorption of food, so nutritional deficiencies are less of a problem compared to RYGB or BPD-DS (Scott & Batterham, 2011). In people with very high body mass index (BMI), VSG, as a stand-alone procedure, results in an average weight loss of greater than 50% of EWL. In patients with very high BMI, the VSG may be followed by a modified RYGB or BPD-DS if significant weight loss is still needed. Since many adults who are morbidly obese have multiple co-morbidities, RYGB or BPD-DS may be too risky as an initial procedure (Benaiges et al., 2011). Usually, 12-18 months post-VSG, once the patient's health has improved and some weight has been lost, a second surgery may be undertaken (Aurora, Khaitan, & Saber, 2012; Benaiges et al., 2011; van Rutte, Smulders, de Zoete, & Nienhuijs, 2013).

Since VSG is a relatively new procedure, long-term benefits and risks are still being evaluated. Typical surgical risks such as infection and blood clots apply; moreover, the sleeve itself can have leakage (van Rutte et al., 2013). Leakage occurs in less than 2.4% of patients for all sleeve procedures which can be successfully treated by operative or percutaneous drainage and endoscopic stenting (Aurora et al., 2012). Sleeve leakage symptoms include fever, pain in chest/shoulder area, heart palpitations, dizziness, nausea and vomiting (Aurora et al., 2012). VSG is associated with greater weight loss than LAGB, but subsequent weight gain has been seen in nearly all studies where follow-up exceeds 5 years (Aurora et al., 2012; Caiazzo & Pattou, 2013).

Biliopancreatic diversion with duodenal switch (BPD-DS). BPD-DS or more commonly referred to as the "duodenal switch" is a more complicated, invasive version of the RYGB and is performed less frequently (Hedberg & Sundbom, 2012; Mitchell et al., 2009). Even though as much as 70% of the stomach is removed during the BPD-DS, the remaining pouch is still larger than those formed during RYGB or LAGB (Mitchell et al., 2009; Nilsson,

Hedberg, & Ohrvik, 2011). As a result, larger meals can be consumed in a sitting; however, there is also a greater, more serious risk of nutritional deficiencies (Quilliot et al., 2010; Dorman & Rasmus et al., 2012). Since much of the small intestine is bypassed, digestive enzymes cannot mix with food until it reaches the distal ileum (Nilsson et al., 2011; Prachand, Ward, & Alverdy, 2010). The need for dietary supplements is higher among patients with BPD-DS compared to RYGB (Hedberg & Sundbom, 2012; Quilliot et al., 2009).

This surgery both restricts intake and reduces absorption area thereby resulting in rapid weight loss with an average long-term EWL of 70% to 80% (Dorman & Rasmus, et al., 2012; Hedberg & Sundbom, 2012; Mitchell et al., 2009; Prachand et al., 2010). In addition to the rapid weight loss, remission rate for type II diabetes is impressive at 100% within one year of surgery (Iaconelli et al., 2011). Co-morbidities such as hypertension, hyperlipidemia, and cardiovascular disease were also significantly reduced (Dorman & Rasmus et al., 2012; Iaconelli et al., 2011; Prachand et al., 2010). Even with all these positive outcomes, BPD-DS is not without risks. BPD-DS poses many of the same risks as RYGB, including dumping syndrome, GERD, gallstone formation, and hernias (Prachand et al., 2010). Comparing BPD-DS with RYGB, post-surgery BPD-DS required longer hospital stays and more frequent early reoperation than RYGB (Hedberg & Sundbom, 2012). Nevertheless, overall there were no differences in late reoperation rates between the two groups (Hedberg & Sundbom, 2012; Nilsson et al., 2011). Despite the complications associated with BPD-DS, one study reported better weight and co-morbidity control than with RYGB, with even more pronounced benefits among super-obese patients (Hedberg & Sundbom, 2012; Nelson, Blair, & Martin, 2012; Prachand et al., 2010). Because of infection, sepsis, and nutrition deficiencies, mortality rates are greater, ranging from 2.5% to 5%, regardless of age (Hedberg & Sundbom, 2012; Prachand et al., 2010).

Bariatric Surgery Candidate Selection

The medical community recommends that surgical treatment of obesity should only be considered after all nonsurgical methods are exhausted (Yermilov, McGory, Shekelle, Ko, & Maggard, 2009). Potential bariatric patients are required to have attempted and failed several traditional diet methods (van Hout, van Oudheusden, Krasuska, & van Heck, 2006). Moreover, in 1991, the National Institutes of Health (NIH) first established bariatric patient selection guidelines which included a BMI of 40 or more or a BMI of 35-39 with one or more obesity-related co-morbidity for people ages 18 to 50 (Yermilov et al., 2009). Age restrictions were initially in place because it was believed that the health risks of bariatric surgery surpassed beneficial outcomes for aging patients (Pratt, McLees, & Pories, 2006; Quebbemann, Engstrom, Siegfried, Garner, & Dallal, 2005). In 2006, the NIH recommendations changed, and Medicare reversed its policy to deny bariatric requests based solely on age; therefore, age restrictions were eliminated (Henrickson, Ashton, Windover, & Heinberg, 2009; Yuan et al., 2009).

Statement of the Problem and Purpose of Study

Bariatric surgery can offer patients an effective and long lasting treatment for obesity and its related diseases. There does not appear to be any one bariatric surgical procedure that is recommended for older adults, so individual needs should be taken into consideration when exploring options. Literature is limited concerning long-term outcomes of older adults who choose to have bariatric surgery. This may be due to the short time since the NIH withdrew age limitations and Medicare inclusion of bariatric surgery in 2006. Although a number of studies have demonstrated that the surgery is safe for older adults, many research opportunities remain. Currently, there is insufficient evidence concerning the benefits of bariatric surgery for older adults. Many of the available studies review the immediate response to the surgery while still in

the hospital by analyzing events such as the length of surgical procedure or hospitalization. The primary purpose of this study was to assess self-reported post-operative outcomes in long-term bariatric patients regarding dietary adherence, health impacts, quality of life, well-being, and psychosocial outcomes. A secondary purpose of this study was to gain an understanding of psychosocial variables (i.e., self-concept) and the influence these factors have on weight regain in long-term patients, including post-bariatric follow-up.

Significance of the Study

This study is significant since there is a paucity of published research that examines outcomes of bariatric patients who are past the first year post-surgery. Moreover, there is limited research that investigates the health and psychosocial impacts of bariatric surgery in long-term patients. The majority of the research on bariatric surgery focuses primarily on physical health-related outcomes. There is limited in-depth research that in addition to health impacts, also examines personal and psychosocial experiences that patients face following the first year post-bariatric surgery. There are no studies that the researchers have found that tie all of these aspects together.

Assumptions

The researchers assumed that individuals meeting the criteria for participation answered all questionnaire items honestly and accurately.

Dissertation Organization

This dissertation is organized into chapters as follows: Chapter one consists of the introduction to the study including the purpose and significance of the study, assumptions, a description of how the dissertation is organized, and a list of definition of terms. Chapter two yields a review of the literature containing the most recent studies conducted as they pertain to

the older adult and general bariatric population. Chapter three consists of the methods used to conduct the study, including research questions, a description of the sample, recruitment, IRB approval, research design, instrumentation, data collection procedure, and description of data analysis. Chapter four consists of the researchers' published review of the literature as it pertains to older bariatric patients. Chapters five and six consist of two manuscripts of the study on individually chosen topics based on the results. Finally, chapter seven presents a summary of the overall study, limitations of the study, and conclusions drawn.

Definition of Terms

Bariatric surgery: Describes several procedures designed to reduce food intake and effect weight loss for individuals who failed to lose weight through diet and exercise. The most common types of bariatric surgery include: Roux-en-Y Gastric Bypass (RYGB), Laparoscopic Adjustable Banding (LAGB), Vertical Sleeve Gastrectomy (VSG), and Biliopancreatic Diversion with Duodenal Switch (BPD-DS) (Neff et al., 2013).

Binge eating: Recurrent loss of control over eating large amounts of food over a short period of time (Saunders, 2004).

Body mass index (BMI): Body mass index (BMI) can be calculated using an individual's height and weight and is a reliable indicator of body fatness in most people (CDC, 2011). An individual's BMI can be calculated by dividing the weight in kilograms by the height squared in meters (kg/m^2). Based on these numbers, individuals are be placed into BMI categories that include: underweight (>18.5 kg/m^2), healthy weight (18.5-24.9 kg/m^2), overweight (25.0-29.9 kg/m^2), and obese (>30kg/m^2).The normal amount of body fat (expressed as percentage of body fat) is between 25%- 30% in women and 18%-23% in men (CDC, 2011).

Co-morbidities: Conditions existing simultaneously with and usually independently of another medical condition such as obesity (Adams et al., 2012).

Excess weight loss: (EWL): Weight loss after surgery varies depending on the surgical method chosen and the length of time after surgery. The %EWL can vary depending on the definitions of ideal body weight used by a given surgeon and the preoperative weight of the individual (Lutfi et al., 2006).

Ghrelin: A 28-amino-acid peptide hormone that is secreted primarily by stomach cells and that has been implicated in the stimulation of fat storage and appetite (Pournaras & le Roux, 2010).

Health-related quality of life: (HRQoL): Refers to impact that health conditions have on an individual's general life functioning and well-being (Kolotkin, Meter & Williams, 2001).

Morbid obesity: A BMI of over 40 (CDC, 2011).

Obesity: An excess of body fat as expressed by BMI. Women with over 30% body fat and men with over 25% body fat are considered obese (CDC, 2011).

Psychosocial: Relating to the interrelation of social factors and individual thought, behavior, and mental health (Mamplekou et al., 2005).

Quality of life (QoL): A broad, multidimensional concept that usually includes subjective evaluations of both positive and negative aspects of life (Folope et al., 2008; van Hout & van Heck, 2009). Examples include an individual's perceived daily overall well-being level or lack thereof and how well-being may be affected by disease, disability, and/or disorder (Folope et al., 2008; van Hout & van Heck, 2009).

Set-point theory: A weight theory that the body maintains its normal weight and body fat level with internal regulatory controls that dictate how much fat one has. The set point theory

suggests that despite dieting efforts, the body tends to return to its set point weight (Tadross & le Roux, 2009).

Social Cognitive Theory (SCT): Developed in 1986 by Albert Bandura and posits that learning occurs in a social context with a dynamic and reciprocal interaction of the person, environment, and behavior (Bandura, 2002). Major tenets include:

Expectations: This refers to the anticipated consequences of a person's behavior. Outcome expectations can be health-related or not health-related. People anticipate the consequences of their actions before engaging in the behavior, and these anticipated consequences can influence successful completion of the behavior (Bandura, 2002).

Reciprocal determinism: This is the central concept of SCT. This refers to the dynamic and reciprocal interaction of person (individual with a set of learned experiences), environment (external social context), and behavior (responses to stimuli to achieve goals) (Bandura, 2002).

Self-efficacy: An individuals' confidence in their ability to change behaviors. Self-efficacy affects the amount of energy that an individual will expend and the extent to which the individual will persist despite adversity (Bandura, 2002).

Super Obesity: A BMI of over 50 (CDC, 2011).

CHAPTER II. REVIEW OF LITERATURE

This review examines bariatric surgery as a treatment option for obese adults who are ≥ 55 years old. A detailed review of literature search was conducted to retrieve relevant articles on bariatric surgery for older adults using EBSCO, MEDLINE, PROQUEST and WEB of SCIENCE with the forward option. A total of 478 articles were evaluated and 180 were deemed relevant and utilized for this review. Relevant articles described various types of weight loss surgery including benefits and side effects, post-operative changes in co-morbidities and quality of life outcomes, and costs of surgery with related cost savings after surgery.

Costs of Obesity and Bariatric Surgery

Healthcare utilization and healthcare costs for the morbidly obese are 81% above those of the non-obese population (Hensrud & Klein, 2006). Analysis of bariatric surgery costs of 3651 patients showed a strong return on investment up to five years post-procedure (Cremieux et al., 2008). Estimated costs in 2010 of laparoscopic and open gastric bypass were $17,000 and $26,000, respectively (Felix & West, 2013). Even with high surgical expenditures, cost savings started accruing within three months post-procedure (Bradley & Sharma, 2006; Campbell et al., 2010; Crémieux et al., 2008; Klein, Ghosh, Cremieux, Eapen, & McGavock, 2011). The short-term return on investment associated with bariatric surgery is consistent with decreases in multiple co-morbid conditions, including diabetes, coronary artery disease, hypertension, and sleep apnea (Crémieux et al., 2008; Klein et al., 2011). The cost reductions in these diseases take into account prescription drug usage, hospital stays, and physician visits (Cremieux et al., 2008). Type II diabetes is greatly improved by bariatric surgery (Klein et al., 2011) and an estimated annual costs of managing a diabetes patient ($13,243) is five times more than a patient without

diabetes ($2,560) (Campbell et al., 2010). An estimated one-third of all Medicare dollars are spent on the cost of care of people with diabetes (Neovius et al., 2012).

Outcomes of Bariatric Surgery for Older Adults

Bariatric surgery often results in effective and enduring weight loss with complete resolution or significant improvement in obesity-related co-morbidities (Buchwald, 2005; Henrickson et al., 2009). After Medicare authorized approval of bariatric surgery for older adults in 2006, 2.7% of all bariatric operations were performed on patients older than 60 years that year (Varela, Wilson, & Nguyen, 2006). Younger patients may have a greater EWL and have a more complete resolution of their co-morbid conditions, but older people tend to reduce the number of prescribed medications, thus reducing healthcare costs (Adams et al., 2012). Age did not influence the rate of occurrence of post-operative complications and outcomes between older and younger patients (Felix & West, 2013; Sjöström et al., 2012; Sugerman et al., 2004).

Not all medical issues are resolved with bariatric surgery. One of the many studies that looked at medical issues compared obese individuals who had bariatric surgery with obese patients who were treated by conventional methods for hypercholesterolemia over a 10-year period (Sjöström et al., 2004). Sjöström (2004) found that the bariatric surgery group did not have significant improvements in hypercholesterolemia (Sjöström et al., 2004). Many of the studies supporting the benefits of bariatric surgery are short-term studies (Dunkle-Blatter et al., 2007; Folope et al., 2008; Poirier et al., 2011; Saeidi, et al., 2013). For example, (Herron & Tong, 2009) noted that much of the present research identifies bariatric surgery as one of the most effective tools for the treatment of severe obesity and metabolic abnormalities.

Consequences of bariatric surgery. Benefits of bariatric surgery include a decrease in co-morbidities, chronic disease risk, and medication-use coupled with improved mobility and quality of life (Bradley & Sharma, 2006; Ewing, Thompson, Wachtel, & Frezza, 2011; Neff et al., 2013). Negative side effects include surgical failure, changes in psychological status, and increased physical and mental stress (Folope et al., 2008; Hensrud & Klein, 2006; Karlsson, Taft, Rydén, Sjöström, & Sullivan, 2007; Sjöström et al., 2012).

Reduction of cardiovascular disease, cancer, and type II diabetes. Physical outcomes of bariatric surgery have shown dramatic improvements over the last decade (Dimick, Nicholas, Ryan, Thumma, & Birkmeyer, 2013), but the greatest benefits to bariatric surgery are the reduction in morbidity and mortality. The most common obesity-related chronic diseases are type II diabetes, hypertension, heart disease, stroke, certain types of cancers, metabolic syndrome, respiratory disease, sleep apnea, fatty liver disease, osteoarthritis, gall bladder disease, pulmonary embolism, GERD, urinary incontinence, chronic renal failure, gout, and depression, all of which can be improved by weight loss from bariatric surgery (Poirier et al., 2011; Zamosky, 2013.).

Individuals who underwent bariatric surgery had a significantly reduced number of total and fatal cardiovascular events compared with matched obese controls that did not undergo surgery (Sjöström et al., 2012; Bray, 2007). Moreover, Vogel and colleagues (2007) found reductions in predicted coronary heart disease risk following significant weight loss after bariatric surgery. Jazet and colleagues (2007) showed that patients who underwent LAGB had considerable weight loss, which reduced cardiovascular risk factors and a significant decrease in systolic blood pressure.

Further, cancer rates have been reduced by nearly 50% in post-surgical bariatric patients (Sjöström et al., 2012; Bray, 2007). One study of obese patients monitored over a 10-year period compared morbidity and mortality rates of a group that underwent bariatric surgery and a group that did not (Sjöström, 2008). Sjöström (2008) found that the overall mortality of the surgical treatment group was reduced by 23.7%. The most common cause of death in each group was myocardial infarction and cancer. An earlier study conducted by (Sjöström et al., 2007) found that bariatric surgery for the severely obese reduces mortality risks.

Bariatric surgery for older patients has been shown to be safe and effective for EWL and improvement of obesity co-morbidities, especially type II diabetes and blood pressure with trends in greater improvement for older patients than younger patients after RYGB (Dunkle-Blatter et al., 2007). Many obese patients who have type II diabetes experience normalization of blood sugars within days post-surgery (Dunkle-Blatter et al., 2007). Patients can frequently stop taking diabetes medications before leaving the hospital after surgery (Dunkle-Blatter et al., 2007). Being able to reduce or eliminate daily diabetes glucose testing and insulin injections leads to improved quality of life. Currently, research on glucose metabolism is underway to better understand this outcome phenomenon (Dunkle-Blatter et al., 2007; Saeidi et al., 2013).

Quality of life measures and physical mobility. Regardless of age, improved mobility, reduced co-morbidities, pain reduction, and enhanced psychological functioning such as improvements in mood, self-esteem, social functioning, and sexuality led to improved quality of life enrichment in bariatric patients (Folope et al., 2008; van Hout & van Heck, 2009). Burgio, Richter, Clements, Redden, & Goode (2007) found that chronic health problems which affect quality of life such as urinary and fecal incontinence symptoms improved following bariatric surgery. In addition, bariatric patients had significantly better health perceptions, social

interactions, psychosocial functioning, and reduced depression post-procedure (Karlsson et al., 2007). Improved mobility and fewer medications alone led many participants who underwent bariatric surgery to state they had experienced improved mood, regardless of whether all weight loss goals were met, and would opt to have the surgery again (Dunkle-Blatter et al., 2007; Folope et al., 2008; Karlsson et al., 2007; van Hout & van Heck, 2009).

Wheelchair-bound older patients were often fully ambulatory within months post-surgery (Sugerman et al., 2004). Even modest weight loss improved overall physical functioning of older adults (Sugerman et al., 2004). For example, patients with lower extremity arthritis experienced reduced knee and hip pain (McTigue, Hess, & Ziouras, 2006; van Hout & van Heck, 2009). Back pain decreased following bariatric surgery, as well (Khoueir et al., 2008). One study found evidence suggesting significant improvements with musculoskeletal problems in patents following weight loss post bariatric procedure (Hooper, Stellato, Hallowell, Seitz, & Moskowitz, 2007). Patients reported the greatest improvement in cervical and lumbar spine, foot, and fibromyalgia syndrome pain. Lower and upper extremity pain was also significantly improved, resulting in an increase in activity leading to reduced pain levels (Hooper et al., 2007). However, nutrient deficiencies negatively affect quality of life by requiring extra doctor visits, vitamin supplements, iron infusions, B-12 injections, and physical symptoms of lethargy (Jáuregui-Lobera, 2013; Saltzman & Karl, 2013).

Food intolerances. Food intolerance resulting in a lack of vitamin and mineral consumption and absorption can be a problem for all patients after weight loss surgery, regardless of type, and can result in osteoporosis and anemia (Mathus-Vliegen et al., 2012). This can be a more critical concern for an older bariatric patient. Since there is an increased risk of bone fractures for those who developed osteoporosis, recovery from hip fracture can prove to be

problematic for aging patients (Dunkle-Blatter et al., 2007). If left untreated, low intake of heme iron foods can increase the risk of lethargy, leading to a decrease physical activity and an increase in muscle mass loss, which can facilitate frailty and malnutrition in older patients (Dunkle-Blatter et al., 2007). Patients reported a sense of control over food intake that they never felt before, but certain food intolerances such as meat and coarse vegetables can make consuming nutrient rich foods problematic (Hensrud & Klein, 2006).

Since weight loss post-surgery is initially rapid, losing muscle and bone mass is a valid concern in older patients. As one ages, the loss of muscle mass, known as sarcopenia, usually occurs as part of the aging process (Berarducci, 2007). But losing additional muscle mass through rapid weight loss has the potential to result in more mobility issues for older adults (Berarducci, 2007). Post-operative diet and exercise regimes are recommended for all surgeries and all patients, but certain health challenges may make it more complicated for older adults to adhere to strict programs (Gremeaux et al., 2012). Obesity was once believed to be bone protective, but recent research has introduced evidence of greater risk for metabolic bone disease due to lack of vitamin D (which is stored in fat) resulting in inadequate calcium absorption, sedentary lifestyle, chronic dieting, and underlying diseases (Berarducci, 2007). After bariatric surgery, the risk of bone-related diseases increases due to restrictive intake, malabsorption, and poor compliance to vitamin and mineral supplement recommendations and dramatic weight loss (Berarducci, 2007; Mathus-Vliegen, 2012; Mathus-Vliegen et al., 2012; Poirier et al., 2011).

Role of Patient Compliance after Surgery

The reported benefits of bariatric surgery may be dependent on the patient's level of compliance after surgery. The level of adherence may be an indicator of the patient's motivation to prevent relapse. A significant number of patients do not follow aftercare recommendations

regarding check-ups and follow-up care after the first six months post-procedure (Harper, Madan, Ternovits, & Tichansky, 2007). Even though similar pre-surgical weight existed between patients who adhered to surgical follow-up visits vs. patients who did not, the patients who did not adhere to follow-up care experienced less weight loss post-procedure. However, patients tended to follow-up with their surgeon after prompted by their bariatric clinic (Harper et al., 2007).

Karlsson et al.,(2007) discovered most weight loss occurred during the first year after bariatric procedure. Weight regain occurred between one and six years after bariatric procedure and was observed with a gradual decline in health-related quality of life (Karlsson et al., 2007). Moreover, one of the few long-term studies found that six to ten years after bariatric surgery, patients had fairly stable weight and health-related quality of life (Karlsson et al., 2007). Despite the weight regain, patients still identified with a positive health-related quality of life if 10% of the weight loss was maintained. Further, Karlsson et al. (2007) found a continued need for a long-term study of implementing lifestyle modification techniques and post-operative management of patients.

Weight Loss Post-Procedure

There are other factors that may impact weight loss following bariatric surgery. One study identified behavior predictors of substantial weight loss following RYGB which included surgeon follow-up, attendance at post-procedure support groups, physical activity, single or divorced marital status, self-esteem, and less binge eating (Livhits et al., 2010). Substantial weight loss was defined as those individuals who lost at least 50% of their excess weight. One hundred eighty patients were evaluated for predictors of success after laparoscopic gastric bypass (Lutfi et al., 2006). Of these 180, 147 patients achieved successful weight loss (EWL of 52.8%)

one year post-procedure (Lutfi et al., 2006). The results indicated that single patients achieved greater weight loss than married patients (89.9% vs. 77.7%; $p = 0.04$). Further, patients with a BMI ≤50 had greater weight loss success than those with a BMI > 50 (91.7% vs. 61.6%; $p = 0.001$). Caucasian patients achieved a higher percentage of EWL than African Americans, but this was not statistically significant (82.9% vs. 60%; $p = 0.06$) (Lutfi et al., 2006).

Weight loss after surgery varies depending on the surgical method chosen and the length of time after surgery. Cummings Overduin, and Foster-Schubert (2004) found that typical weight loss after two years post-procedure is 35-40% for RYGB, and less for LAGB. According to Sjöström (2008), a sample of Swedish post-bariatric surgery patients had a re-stabilization weight that leveled out after 8 years. Sjöström (2008) also found that 10 years after surgery, EWL was 14% for LAGB and 25% for RYGB patients (Sjöström, 2008).

Unknown physical factors may affect the amount of weight a person loses, such as how the pouch empties and possible changes in the individual's set point weight following surgery. Set point theory suggests that an individual's body has a particular range of weight that it is comfortable in, usually within a range of 10% (Tadross & le Roux, 2009). For example, patients who have prompt emptying of their pouch following RYGB tend to lose a greater amount of weight than other RYGB patients who have slow or no emptying of the gastric pouch (Akkary et al., 2009). The cause of the difference in the rate of gastric pouch emptying is unknown. The notion of set point theory and the belief that the body is genetically predisposed to a determined weight set point may make it difficult to maintain weight loss (Tadross & le Roux, 2009). The body uses regulatory mechanisms to keep the weight in this set point range. However, individuals who have RYGB surgery seem to have unexplained changes in the energy regulatory system which may appear to establish a lower set point (Tadross & le Roux, 2009).

Another physiological component that may contribute to weight loss with RYGB and VSG respectively is a decreased release of the hormone ghrelin following surgery (Cummings, 2003; Cummings, Bloom, & Rubino, 2012; Roth et al., 2009). Ghrelin is thought to stimulate appetite, and a decrease in ghrelin following RYGB and VSG is thought to be involved in increased satiety leading to weight loss (Roth et al., 2009). However, the position of the staple line and other physiological variations within the procedures during the procedure may produce conflicting results regarding the role of ghrelin hormones (Roth et al., 2009).

Few studies examined patients' long-term weight loss (Bond, Phelan, Leahey, Hill, & Wing, 2009; Kruseman, Golay, Zumbach, & Leimgruber, 2010). For instance, one study in a Swiss university hospital followed 80 women for eight years (± 1.2 years) who had RYGB between 1997 and 2002 (Kruseman et al., 2010). The patients were evaluated on dietary and anthropometric changes, eating patterns, psychological changes, and quality of life at least 5 years post-procedure. Successful long-term weight loss was defined in the Swiss study as EWL of 50%. The results of the study indicated that 50% EWL was achieved by 47 patients (59%). The researchers found that patients who achieved EWL of 50% were younger and had a greater number of psychological consultations prior to surgery.

Weight Regain Post-Procedure

An understanding of the mechanisms of weight regain from previous failures may contribute to the participant's ability to maintain long-term weight loss (Kiernan et al., 2013). Thus, exploring the mechanisms that may contribute to weight regain is important. Perhaps one of the greatest fears of post-bariatric patients is weight regain following significant weight loss. Nevertheless, preventing weight regain is one of the greatest challenges following massive weight loss (Jeffery et al., 2000; Kiernan et al., 2013). Contributing factors to weight regain may

include disinhibition of eating, grazing behavior, food cravings, frequency of weighing, not following aftercare recommendations, and lack of social support. Disinhibition of eating may be an important factor leading to weight regain (Kofman, Lent, & Swencionis, 2010). Susceptibility to cues that trigger overeating may increase the potential for regaining weight regardless if the person lost weight through surgery or nonsurgical means (Bond et al., 2009). In a study, 105 surgical participants were matched with 210 nonsurgical participants from the NWCR by gender, entry weight, maximum weight loss, and weight maintenance duration. The participants lost approximately 56 kg (123.5 lbs.) and kept at least 13.6 kg (29.9 lbs.) off for 5.5 to 7.1 years. The weight regain for both groups averaged about 2 kg (4.4 lbs.) per year. The participants were evaluated at entry and one year post-procedure. The results indicated that surgical participants had less physical activity, greater fast food and fat intake, less dietary control, greater depression, and greater stress at both entry and one year post-procedure than the nonsurgical participants (Bond et al., 2009). However, both groups reported higher levels of disinhibition at entry and one year post-procedure with similar weight gain. Disinhibition of eating in response to internal cues is associated with weaker long-term weight loss outcomes (Niemeier, Phelan, Fava, & Wing, 2007).

Internal disinhibition predicts weight regain after weight loss and weight loss maintenance; however, several factors may be involved (Niemeier et al., 2007). In one study, 268 participants in a behavioral weight loss trial and 3345 participants from the NWCR were evaluated on two factors of the disinhibition scale: eating in response to feelings and thoughts (internal factors) and eating in response to social events (external cues) (Niemeier et al., 2007). The results suggested that external cues did not predict weight loss; however, internal disinhibition predicted weight change in both groups. Difficulty with disinhibition may have

been an underlying factor contributing to grazing behavior. Grazing behavior may be a significant component of weight regain. The bariatric patient may stumble into the behavior of grazing simply because it allows them to feel mentally satisfied without feeling overly full or dumping (Niemeier et al., 2007). The behaviors of eating frequent high caloric small meals throughout the day may contribute to weight regain and grazing may correlate to lack of successful of weight loss (Engstrom & Quebbemann, 2005; Quebbemann et al., 2005).

Some researchers also believe that many patients exhibited the pre-surgery eating pattern of binge eating, but with the post-surgery patient, binge eating may appear as grazing because the physiological changes in the body due to surgery only allow for small portions of food to be continually consumed throughout the day (Saunders, 2004). Further, Crowley, Budak, Karl Byrne, and Thomas (2011) found evidence that patients who demonstrated greater binge eating behaviors prior to RYGB surgery had less weight loss at six months post-procedure than those patients who exhibited less binge eating behavior.

There are contradictions in the literature. For instance, some studies report a connection between pre-surgery binge eating and less weight loss to weight regain within 2 years after RYGB (Dymek, le Grange, Neven, & Alverdy, 2001; Kalarchian et al., 2002; Sallet et al., 2007). Other studies have not found a significant relationship between binge eating prior to surgery and weight loss up to six years post-surgery (Alger-Mayer, Rosati, Polimeni, & Malone, 2009; Bocchieri-Ricciardi et al., 2006; Burgmer et al., 2005). It seems difficulties with post-procedure weight gain or difficulty with weight loss were related to post-procedure eating behavior of grazing and not connected to prior binge eating behavior. Crowley et al. (2011) suggested that differences in these finding may be related to the pre-operative binge eating dynamics. Some binge eating may be related to difficulty with recognizing fullness cues, whereas other binge

eating episodes may be related to difficulty with environmental or internal triggers. Patients who struggle with fullness cues would benefit from RYGB because of the physiological nature of the surgery (Crowley et al., 2011). However, it was hypothesized that those who struggled post-operatively with environmental or internal triggers would not benefit from RYGB, as the triggers have a psychosocial drive to the binge eating patterns. Crowley and colleagues found evidence that those patients who had more cognitive triggers based on scores of the instrument, Inventory of Binge Eating Situations scores. They found that prior to RYGB these patients had less weight loss at six months post-surgery (Crowley et al., 2011).

Food craving may be another underlying factor that contributes to weight gain. The initial suppression of food cravings that occurs following the surgery may give patients a false sense of security. Weight regain may begin to occur when individuals struggle with the return of these food cravings (Crowley et al., 2011). A study which combined cognitive-behavioral therapy and motivational interviewing to address weight regain was conducted with 14 female patients who were at least 18 months post- surgery from RYGB (Stewart, Olbrisch, & Bean, 2010). The participants engaged in an eight-week pilot therapy intervention program. Participants reported difficulty coping with the return of food cravings that led to challenging eating behaviors, which had initially subsided following the surgery. The group intervention appeared to help with increasing motivation and confidence, along with the return to healthier eating behaviors. The group reported peer support as an essential component (Stewart et al., 2010).

Individuals who decrease their weighing frequency from baseline weighing to one year gain more weight than individuals who keep their frequency of weighing the same or increase weighing frequency (Butryn, Phelan, Hill, & Wing, 2007; Wing et al., 2007). Further, patients who decrease weighing frequency tend to increase daily calories consumed from fat and

disinhibition, and exhibit a decrease in cognitive restraint. Frequent weighing may increase individual accountability. Many patients begin to regain weight once they stray from the recommendations of the post-operative plan (Wing et al., 2007). Another study indicated 47 to 50% of participants report not following post-surgery diet recommendations and decreased physical activity despite typically participating in an intensive pre-operative educational program and having access to educational resources as part of the continuing post-operative plan. Post-surgery diet habits that should not be followed may include continuing to eat small, but more frequent meals throughout the day (grazing) and eating high-calorie dense foods (Tejirian, Jensen, Lewis, Dutson, & Mehran, 2008).

Pre-surgery bariatric patients may have years of unhealthy physiological and psychological eating patterns ingrained that may include rapid eating, binge eating, continuous snacking, and emotional eating. Initially, the surgery may help reduce these maladaptive eating patterns by the sheer physical and anatomical mechanism of the surgery. However, one must consider the often life-long eating patterns that must be changed with the altered physiological components. Without addressing possible psychological issues, the patient may override the biological mechanism and regain the weight. Weight regain is a concern because patients may return to having health issues that were previously resolved with the surgery and immediate weight loss (Shah, Simha, & Garg, 2006). Weight regain is a complex issue with many mechanisms at work. The process in post-bariatric patients to maintain long-term weight loss following bariatric surgery can be difficult.

Maintenance of Weight Loss

Outcomes of bariatric surgery should not be assessed by weight loss alone. Improvement of both overall quality of life and co-morbidities must be included in assessment outcomes.

Long-term weight maintenance is an area that likely is enhanced by behavioral intervention (Greenberg et al., 2005; Hsu et al., 1997). Understanding the factors that lead to weight maintenance following a significant weight loss is perhaps one of the most important components for a person struggling with obesity. The bariatric individual may have experienced years of weight loss, followed by weight regain. While bariatric surgery is the most effective long-term weight loss method to date, weight maintenance after surgery is essential. Strategies to prevent relapse and maintain weight loss are very important. Exploring weight maintenance strategies provides insight into techniques employed by participants of some research studies. The frequency that individuals weigh themselves may influence the amount of weight lost along with the vigilance of adhering to their diet and related behavior changes. For instance, frequent weighing is helpful for identifying weight regain before it escalates (Butryn et al., 2007; Wing et al., 2007). Further, individuals who maintain a weight loss typically weigh themselves from once daily to once weekly. Individuals who weighed themselves daily for 18 months reported having fewer than four binge episodes per month and a decrease in disinhibition (Wing et al., 2007).

Klem and colleagues (2011) examined a sample of 134 members of the NWCR. Half had undergone bariatric surgery, while half reported losing weight with the help of a commercial program, a self-help group, or a health professional. Each was then computer-matched to a control that had lost weight without surgery. The behaviors used by bariatric participants to maintain their weight losses were very different from the weight maintenance behaviors used by participants who had not had surgery. Bariatric participants reported eating a diet considerably higher in fat and lower in carbohydrates and protein than the group who forwent surgery. Bariatric participants reported lower levels of physical activity than non-bariatric patients. The reported differences may be related to physiological differences between the groups. Bariatric

participants may have developed dumping syndrome in which carbohydrate rich foods cause nausea and other unpleasant side effects, leading to an aversion to such foods. Despite differences in diet and physical activity, the majority of participants in both groups indicated weight-loss maintenance had been accompanied by significant improvements in general mood, self-confidence, quality of life, job performance, and interactions with friends and family (Klem et al., 2011).

Furthermore, individuals who participated in a weight maintenance intervention program (WMIP) after participating in a behavioral weight loss program not only maintained their weight loss, but also had greater weight loss overall compared to individuals who only completed a behavioral weight loss program without the follow-up WMIP (Carels et al., 2008). Individuals who participated in the additional WMIP also reported increases in physical activity. In addition, fitness improved dietary habits, suggesting that a 6-month maintenance program may assist individuals with reducing behaviors or cues to maintain weight loss. Ninety-four bariatric patients who were required by their insurance company to participate in a pre-surgery weight loss regime and 59 patients who were not required to do so were examined pre-surgery and post-surgery. The study found that patients who were not required to follow the weight loss regime pre-surgery gained more weight prior to receiving bariatric surgery, but lost more weight post-surgery than those who were required to engage in the pre-surgery weight loss program (Ochner, Puma, Raevuori, Teixeira, & Geliebter, 2010). While controlling for the initial weight, the findings suggested that the common requirement of insurance companies to have patients complete a medically supervised weight loss program before receiving surgery were ineffective with determining weight loss estimates post-operative (Ochner et al., 2010).

Another factor that may contribute to weight loss maintenance is the notion of mindfulness. Mindfulness is being aware of one's thoughts and actions in the present moment. Mindful eating is defined as being present in the moment with each meal, which eliminates the internal cues (i.e., emotional eating, reward eating, or excessive satisfaction eating) and external cues (i.e. social triggers to eat, being in the presence of food, grazing, snacking, or fast eating) (Engstrom, 2007). Mindfulness may also be effective when combined with cognitive behavioral techniques. In a case study report, Engstrom (2007) examined a 41-year old married female patient who struggled with weight loss following RYGB. After and major psychiatric issues were ruled out; the patient participated in a behavioral and mindful intervention treatment. The treatment focused on behavioral techniques, such as self-monitoring, stimulus control, behavioral pacing, stress management, and mindfulness techniques to develop strategies for changing the participant's attentiveness toward eating.

Pre-surgical psychological testing results indicated the personality profile was basically normal, with slight non-significant elevations in depression and anxiety, a high level of emotional eating and occasional binge eating. The participant had a high level of social support and motivation for the surgery. Prior to the surgery, she read several books on bariatric surgery and attended online chat groups. She lost 28 pounds during the 8 weeks post-surgery, but by 12 weeks post-surgery she was regaining weight. She admitted to increased snacking (three to eight snacks a day) of rich foods between meals when feeling hungry, eating more than she thought she should, and feeling too full after her meals. She identified that most of her eating was related to non-mindful eating triggered by internal cues. The course of her treatment included increasing awareness of and reducing mindless eating, developing mindfulness skills, and increasing "satisfaction" after each meal. She was instructed on timing of meals and stimulus behavior

techniques to avoid grazing. She was provided with techniques on self-monitoring of hunger. At the end of her 9 weeks of mindfulness training treatment, there was a significant decrease with both grazing and emotional eating and a significant increase in mindful eating. At the end of her treatment she had lost 95 pounds (Engstrom, 2007).

Self-monitoring aids in maintaining weight loss following RYGB (Odom et al., 2010). Leahey, Crowther, and Irwin (2008) implemented a 10-week cognitive-behavioral mindfulness-based group therapy intervention to address binge eating in bariatric surgery patients. The results of the study demonstrated a decrease in binge eating symptoms, a decrease in depressive symptoms, along with an increase in emotion regulation skills and increased motivation to change negative eating behavior.

Weight loss from bariatric surgery varies from study to study. Overall, the average weight loss for RYGB surgery is 60% to 61.6% of excess body weight during the first 2 to 3 years post-op (Buchwald, 2005; Shah et al., 2006). However, after 18 months to 2 years following the bariatric procedure, as many as 30% of patients begin to regain weight (Shah et al., 2006). In addition, many researchers define success as 50% EWL maintained (Deitel & Greenstein, 2003; Kruseman et al., 2010; Livhits et al., 2010).

Social Support Post-Procedure

Questions still arise on long-term bariatric surgery success and its effect on weight loss maintenance and the return of lifestyle diseases such as type II diabetes, hypertension, and high cholesterol (Buchenwald et al., 2005; Manzoni et al., 2012). Past research indicated that about a year and a half to two years after surgery, weight loss from surgery stops, and a significant number of individuals begin to regain the weight they had lost (Karlsson et al., 2007; Niego et al., 2007; Shah et al., 2006). This is when support is needed most; nevertheless, many

longitudinal follow-up bariatric surgery studies are short-term and incomplete when evaluating weight loss maintenance and social support (Buchenwald et al., 2005).

Social support can develop from both organic and formal support systems. Organic support includes both family and friendship networks (Hogan, Linden, & Najarian, 2002). Formal support is provided by professionals (such as bariatric support groups through a patient's surgery center) and through social or community bonds such as online weight-loss surgery forums (Hogan et al., 2002). Organic support is generally viewed as a more enduring source of support, while other forms of support may be more transient (Hogan et al., 2002). Though whether one or the other is the "gold standard" of support is not clear. Research indicates that participation and attendance at formal bariatric support groups post-surgery is associated with greater excess weight loss, though it remains unclear what role organic support plays (Klem et al., 2011; Leahey et al., 2008; Livhits et al., 2011).

Attending support groups with others who are losing weight provides peer support and opportunity for guided discussions about changes in body image, meal preparation, relationship issues, and stress management (Macias et al., 2009; McMahon et al., 2006; Orth et al., 2008; Song et al., 2008). Attendance at bariatric support group meetings after weight loss surgery is a valuable component of continuing follow-up care. Evidence shows that one year after surgery, there are significant differences in EWL between patients who attend support groups and those who do not (Livhits et al., 2011; McMahon et al., 2006; Song et al., 2008). Support groups can be held in a variety of formats such as structured meetings or online bariatric surgery forums.

However, there may be a gap in how support groups should be utilized. For instance, many support groups offered by surgical programs may only focus on the pre-surgical and post-surgical needs of the patient only within the first year post-operative (Stewart et al., 2010). There

is a need for a greater focus on cognitive-behavioral therapy groups that address the interrelation among thoughts, feelings, and behaviors that lead to weight regain (Stewart et al., 2010). Furthermore, there is no common standard to which all bariatric clinics are mandated to follow, only sets of recommendations by the American Society for Metabolic and Bariatric Surgery (ASMBS) (ASMBS, 2013). This means that not all support groups are created equal; and each clinic may subscribe to different post-surgery recommendations for their patients to follow. Many formal bariatric support groups cater to newer post-operatives (usually during the first year post-surgery) (Livhitis et al., 2010; McMahon et al., 2006). Because the experiences of newer post-surgery patients usually differ from long-term patients, long-term patients may feel alienated by the topics and discussions at their surgical support group. Other barriers to formal support group attendance included far away locations, difficult group attendance times, and work and family commitments.

Personal Relationships Post-Procedure

Meana and Ricciardi (2008) found that most relationships in the lives of bariatric patients are not immune to change once the weight starts coming off and that relationships are interconnected. A person cannot alter one substantial aspect of life (such as with bariatric surgery) and then expect the change to not have a significant effect on other parts of one's life (Meana & Ricciardi, 2008). Relationships are most prone to change post-surgery, both positively and negatively (Meana & Ricciardi, 2008). Learning new skills in key areas where change creates tension (such as post-surgery dietary and lifestyle overhaul) is essential for reaping the full benefits of surgical weight loss.

Individuals with higher levels of support tend to do better in weight management (Klem et al., 2011). Sarwer, Wadden, and Fabricatore, (2005) found that many marital relationships

improved dramatically post-surgery and that issues regarding divorce were generally tied to poor pre-surgical relationships. Another study found that rates of divorce and separation appear to be higher in relationships that include one bariatric post-operative member than divorce and separation rates are among non-bariatric couples, especially during the first year after surgery (McAlpine et al., 2010).

Relationship issues appear to emerge six to eight months after surgery (McAlpine et al., 2010). As significant weight loss becomes visible, family, friends, and co-workers may make observations and comments about the patient and their body (Bagdade & Grothe, 2012). Even complimentary remarks may be seen as intrusive or judgmental to the bariatric patient (McAlpine et al., 2010). Increased social attention after weight loss can produce anxiety (Bagdade & Grothe, 2012). Most patients find others to be supportive, but negative responses related to jealousy can occur (Bagdade & Grothe, 2012). Strong healthy relationships seem to weather the experience of one member's bariatric surgery, but there is often an adjustment period (McAlpine et al., 2010).

The post-operative period may be quite difficult for some because of the necessary change in eating and lifestyle habits (Sogg & Gorman, 2008; McMahon, 2006). This may be associated with emotional discomfort, so a personal support system of family and friends should be in place (Sogg & Gorman, 2008; McMahon et al., 2006). Peer and family support is important in helping individuals learn greater self- acceptance, develop new norms for interpersonal relationships, and manage stressful work or family-related situations (McMahon et al., 2006). Social support along with strong family support is of great importance to an individual who has undergone bariatric surgery.

Depression and Suicide

A minority of patients may experience an increase in psychological distress after surgery due to life stressors such as severe restriction of food intake, malabsorption of vitamins and minerals, or psychotropic medications (Bagdade & Grothe, 2012). Lack of medication for depressive symptoms can lead to an increase of depressive episodes and emotional distress (Bagdade & Grothe, 2012). There is little research that compares the psychological outcomes between older adults and younger or middle-aged counterparts (Heinberg, Ashton, Windover, & Merrell, 2012).

Though some bariatric patients report an increase of psychological symptoms, yet others report improvements. In one study, 59 bariatric patients were assessed on psychological conditions and quality of life following bariatric surgery (Mamplekou et al., 2005). Prior to surgery, participants were asked to complete a questionnaire evaluating not only their quality of life, but also their social, professional, sexual, and other activities of daily living. Results of the study revealed female participants had a greater degree of depression from obesity than male participants pre-surgery (Mamplekou et al., 2005). Females had significant self-reported post-operative emotional improvement at two years post-surgery and their quality of life (physical, professional, social, and sexual) significantly improved (Mamplekou et al., 2005).

Another seldom researched post-bariatric issue is suicide. Compared to non-bariatric procedure suicides, Tindel (2011) found a substantial number of suicides among all bariatric patients, regardless of surgery type. Tindal (2011) reviewed suicides among all patients who had bariatric surgery in Pennsylvania during a ten year period. Reports of 31 suicides from 16, 683 bariatric surgeries for an overall rate of 6.6 suicides per 10,000 population; 13.7% per 10,000 among men and 5.2 per 10,000 for women. Approximately 30% of suicides occurred within 2

years after surgery and almost 70% occurred within 3 years after surgery. This compared to an age and sex related suicide rate among 35 to 64 years of age of 2.4 per 10,000 men and 0.7 per 10,000 for women (Tindel, 2011). Some studies suggest that severe obesity is also associated with high risk of lifetime suicide ideation (Chen, Fettich & McCloskey, 2012). One study found that 9.1% of 121 bariatric surgery seeking severely obese patients reported having made one or more suicide attempts in the lifetime (N = 1,020) as compared with the national U.S. sample of 0.5% for suicide attempts (Windover, Merrell, Ashton & Heinberg, 2010).

Social Cognitive Theory (SCT)

The SCT is frequently used to help promote health behavior change in areas regarding obesity (Baranowski et al., 2003) and food choices (Kaufman, 2007). SCT explains how people acquire and maintain certain behavioral patterns, while also providing the basis for intervention strategies (See Figure 2.1). Human behavior is explained in terms of a triadic, dynamic and reciprocal model in which behavior, personal factors, and environmental influences all interact. An individual's behavior is uniquely determined by these interactions. The triad concept of SCT cannot be pieced out, as one faction depends on another in a fluid give and take. Instead, all three constructs influence each other and bariatric health professionals need to understand the individual, their families, and their environmental interactions in order to meet the needs of the patient in relation to food choices and weight management (Kaufman, 2007). According to Bandura (2002, p. 144), the main determinants of SCT include:

> …knowledge of health risks and benefits of different health practices, perceived self-efficacy that one can exercise control over one's health habits, outcome expectations about the expected costs and benefits for different health habits, the health goals people set for themselves and the concrete plans and strategies for

realizing them, and the perceived facilitators and social and structural impediments to the changes they seek.

The construct of self-efficacy has been studied in regards to nutrition and physical activity. For example, one Internet-based intervention used SCT constructs to gain a better understanding of the demographic, behavioral, and psychosocial influences of participants involved in an online intervention addressing nutrition and physical activity (Anderson-Bill, Winett, & Wojcik, 2011). Results of the study showed that participants' high self-efficacy and outcome expectation levels did not lead to health behavior change, which may involve low levels of perceived social support (Anderson-Bill et al., 2011). The study determined even though high self-efficacy may be connected to healthier lifestyles, low levels of social support may very well serve as a barrier to behavior change that many people find difficult to work through (Anderson-Bill et al., 2011).

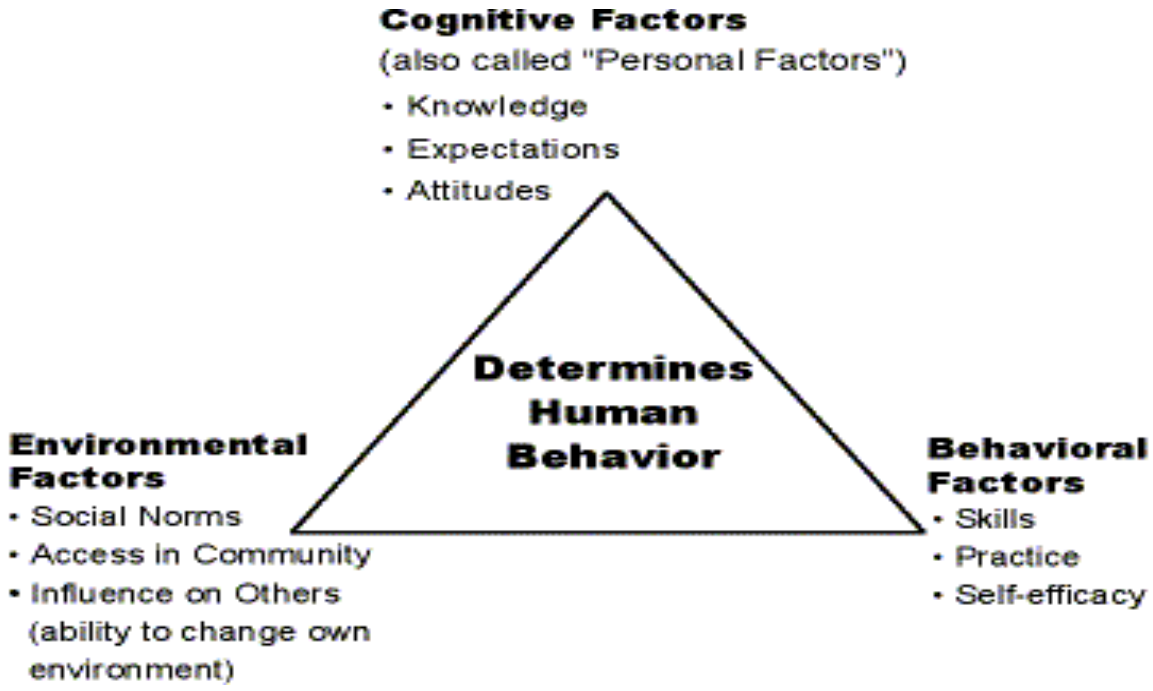

Figure 2.1. Social Cognitive Theory. (Denler et al., 2012)

Theories such as the SCT are designed to assist individuals with making psychological, personal, and environmental behavior adjustments necessary to be successful in weight loss endeavors post-bariatric surgery. Weight loss does not happen in a vacuum, it is fluid with setbacks and miss-steps occurring along the way. Long-term changes in health behavior, like making the life-changing decision to have bariatric surgery involve multiple actions and adaptations over time. In some cases, evaluating the downside of bariatric surgery can propel a person to have greater conviction with eating a healthier diet and exercising more and losing weight without surgery.

Depending on type of surgery , bariatric surgery is generally a permanent commitment, and it should only be considered after all other alternatives to achieve weight loss are exhausted. Moreover, having bariatric surgery is a lifelong decision that requires follow-up care. Applying the SCT theory posits that a person's environment can help or hinder their lifestyle and weight changes. These patients face environmental factors such as medical and psychosocial challenges (for example, social support) that require continuing care for years after surgery, and the hard work only begins post-surgery (Elliott, 2004). A basic premise of SCT is that people learn not only through their own experiences, but also by observing the actions of those around them and the results of those actions.

Public health intervention strategies aiming at the individual level include goal setting, behavioral contracting, and tailored health communication (Painter, Borba, Hynes, Mays, & Glanz, 2008). SCT explains human behavior in terms of a dynamic, reciprocal model in which personal factors, environmental influences, and behavior continually interact. Constructs that are relevant to using the SCT in behavior change include observational learning, reinforcement, self-control, and self-efficacy (Painter et al., 2008). Increasing and maintaining a bariatric patient's

self-efficacy is an important part to successful post-procedure outcomes. Bariatric clinics can build a patient's self-efficacy by continued and relevant social support groups, setting incremental goals that are achievable, and monitoring and reinforcing the patient not just in the first year post-surgery, but for at least five years post-operative.

In addition, not much has been written on the topic of follow-up care, but rather the focus has been on who is a good candidate for bariatric surgery rather than what patients go through after the procedure (Elliott, 2004). While obesity threatens to explode into a reverberating pandemic, there is a need to understand and support those individuals who have made the decision to have bariatric surgery. Using health behavior theories can offer health care professionals needed insight and information to be supportive and provide the care necessary to this vulnerable population. Likewise, bariatric programs address significant public health problems such as obesity and chronic diseases and should strive to complement individual interventions with strategies to develop healthier environments.

Summary

Bariatric surgery can offer patients an effective and long lasting treatment for obesity and its related diseases. There does not appear to be any one bariatric surgical procedure, which is recommended for older adults, so individual needs should be taken into consideration when exploring options. Literature is scarce on the long-term success of older adults and bariatric surgery. This may be due in part to the recently removed age cap that the NIH imposed and 2006 Medicare inclusion of bariatric surgery. A number of studies that have demonstrated that the surgery is safe for the aging population; additionally, co-morbidities improve. Most of the studies reviewed focused on specific health outcomes such as the amount of weight loss, number

of days in the hospital, reductions in prescriptions, changes in morbidity and mortality and safety of procedures for older adults.

CHAPTER III. METHODS

The goal of this research was to evaluate bariatric post-procedure outcomes in long-term patients regarding age, dietary adherence and food intolerances, health impacts, quality of life, well-being, social support, and perceptions of surgical success. The following research questions were explored among the researchers:

1. After surgery, are there different outcomes between older adults and younger adults who are at least 18 months post-surgery?
2. What are the differences in post-surgical outcomes in regards to length of time since surgery?
3. What are the psychosocial challenges long-term patients face due to weight gain after surgery?
4. Does quality of life post-surgery improve in regards to length of time since surgery?
5. What are the general experiences of long-term bariatric patients? (qualitative data)

Research Design

The overarching research design for this study employed survey methods. The primary purpose of this study was to assess self-reported post-operative outcomes via questionnaire in long-term bariatric patients regarding age, weight loss, dietary adherence and food intolerances, health impacts, quality of life, well-being, social support, and perceptions of surgical success. The researchers utilized a combined quantitative and qualitative approach to analyze subjective explanations regarding patients' post-surgery bariatric experiences.

IRB Approval

Prior to the study's commencement, approval was given by North Dakota State University's (NDSU) Institutional Review Board (See Appendix A). The Center for Weight

Management at St. Joseph's Health Services agreed that sole IRB approval by NDSU would be honored and additional IRB approval from the Center for Weight Management was not necessary for this research project. A letter of support stating the agreement is provided (See Appendix B). The researchers were not able to offer an incentive for participation in the study. Information collected through questionnaires was anonymous and NDSU professors provided in-depth statistical consultation. NDSU researchers were not aware of any personal information for participants. Informed consent was provided to potential participants upon invitation to participate in the questionnaire. An IRB signature waiver addendum was approved to further protect the anonymity of participants (See Appendix A).

Populations of Interest

Potential participants were recruited either from public bariatric support forums or through the Center for Weight Management, which specializes in bariatric surgery. Participant criteria for inclusion included those who were at least 18-months post-operative and over the age of 18. Participants were recruited through both outlets regardless of gender, age, surgery type, ethnicity, or socioeconomic status.

Due to HIPAA restrictions, the researchers could only construct the sampling unit from the Center for Weight Management as it was described during a meeting with the bariatric center's liaison and physician's assistant. The sampling unit was a list of a bariatric patients' names and addresses from the Center for Weight Management's database who had surgery at least 18 months ago, and up to 15 years ago at the time the questionnaire was mailed out.

Sampling Frame and Enumeration for the Center for Weight Management

The researchers were not privy to the exact procedures the Center for Weight Management staff used when selecting potential participants, nor how the sampling frame was

structured. The researchers knew the Center for Weight Management administrative staff would identify those patients who met inclusion criteria from their patient database and create address labels for the questionnaire envelopes. In general, any frame problems were not within the researchers' control, as the questionnaires were sent out by the center's administrative staff in order to meet HIPPA regulations. The researchers were unable to take preventative action in regards to these potential problems due to the lack knowledge of the mailing lists and control of the sampling frame. Potential survey participants who met inclusion criteria may have been left off of the Center's mailing list of patients or the Center may not have had correct criteria for inclusion on a patient who should have been put on the mailing list. Moreover, patients who never had bariatric surgery may have been on the mailing list or were less than 18 months post-procedure and under the age of 18. Finally, the questionnaire may have been mailed to the same person more than once.

Data Collection Procedures

The researchers developed a bariatric questionnaire addressing the needs of participants who were at least 18-month post-procedure. The questionnaire included 12 demographic items and 26 five-point Likert-scale items (which focused on changes in body weight, body mass index, nutrition, physical activity, quality of life changes, health status, side effects, and various psychosocial factors such as self-esteem and happiness) and one open-ended question in order to elicit more detailed written responses. The data collection for this questionnaire commenced with mailing paper questionnaires and opening the web-based online questionnaire on or around June 1, 2014. The length of time estimated for completing the questionnaire was approximately 20 minutes.

Questionnaires completed online populated the database automatically. Responses on paper were typed verbatim into the database by two investigators (Geraci and Marihart) and verified by advisors (Hill and Brunt). The output/code for this study was generated using Qualtrics software, version 60114 of the Qualtrics Research Suite. Data collection concluded approximately 12 weeks after the paper questionnaires were mailed.

Internet-based public bariatric support forums. The researchers utilized five online public bariatric forums, which each contain hundreds to thousands of members in various stages of the bariatric surgery process (pre-operative, peri-operative, and post-operative). Although the researchers may have posted recruitment notices with the web-based questionnaire link to online forums, personal contact with participants did not occur and it is unknown how many members actually viewed the recruitment notice. The notice was posted approximately once a week for 12 weeks.

The Center for Weight Management. The Center's personnel used their patient database to identify potential participants meeting inclusion criteria and paper questionnaires were mailed with the option to complete the questionnaire online. The questionnaires were returned to the researchers containing no identifying information. A total of 2,520 paper questionnaires were mailed.

Instrument

After an exhaustive search, the researchers found no existing bariatric questionnaire that met their needs regarding long-term bariatric outcomes. The researchers, therefore, developed a bariatric questionnaire addressing post-operative outcomes in long-term bariatric patients regarding dietary adherence and food intolerances, health impacts, quality of life, well-being, social support, and perceptions of surgical success. The questionnaire included 12 demographic

items (i.e. age, height, four milestone weights, surgery type, relationship status). The four milestone weights included highest weight before surgery, day of surgery weight, lowest weight achieved post-surgery, and current weight. Participants from bariatric forums also reported ethnicity and geographical location. The instrument consisted of 26 five-point Likert-scale items and each of the 26-items was rated from 1 (*highly negative*) to 5 (*highly positive*). Participants rated a variety of post-surgical outcomes including psychosocial items, such as "How has your self-esteem changed since surgery?" (1=*much lower*; 5=*much higher*) and "In regards to the way you look and feel since your surgery, how happy are you?" (1=*very unhappy*; 5=*very happy*). A copy of the questionnaire is located Appendix C.

Pilot Testing

Because reliability and validity had not been established on the developed questionnaire, the researchers conducted a pilot test with a sample of 12 bariatric patients to test for content validity. In addition, 10 experts were contacted (various academic experts, as well as professionals from the Center for Weight Management) for content and readability. Based on the results of the pilot study, the final questionnaire was modified and mailed to potential participants through the Center for Weight Management or made available through a web-based questionnaire link to online support forums.

Data Analysis

The researchers utilized three different analysis methods for this dissertation and an overview is provided below. Detailed data analysis procedures can be found in chapters five and six.

Quantitative analysis. All quantitative data was analyzed using SPSS (version 22.0). Descriptive statistics were employed for relevant anthropometric characteristics and an initial

exploratory analysis was conducted using simple bivariate correlations for post-operative weight regain with a number of key variables. Finally, a multiple linear regression analysis was conducted with weight regain as the outcome variable. This process began with an initial pool of 25 candidate predictor variables, which was trimmed to a final set of six predictors using backward elimination (criterion for variable removal: $p \geq .10$). Backward elimination was used in this study to ensure that any potential suppressor variables would be retained.

General qualitative data analysis and coding. The participants were asked to respond to one open-ended item at the end of the questionnaire: "What else you would like to tell us about your bariatric surgery experience?" Participant responses were combined into a master document and organized systematically according to emerging broad themes. The researchers employed an iterative process in the development of coding categories. Comparing and analyzing patterns assisted with understanding how coding categories were alike and how they were different. After transcription, each response was printed for clarity and codes were manually generated in order to ensure vital information was complete and considered in this study. Codes allowed the researchers to provide direct and indirect information to support potential themes and patterns. In addition, post-it notes of various colors aided in identifying themes. The first transcript reading of responses assisted in developing coding categories, and then the second reading was conducted to start formal coding in a systematic way using colored post-it notes to group related data (Hays & Singh, 2011). The subsequent transcript readings of responses aided in identifying new categories of information and the two lists were merged into one list.

Phenomenographic analysis. There is no single technique prescribed in the analysis of phenomenographic data and many approaches have been taken in past research (Yates et al., 2012). Therefore, the researchers carried out the analysis according to the 7 consecutive steps proposed by Dahlgren and Fallsberg (1991) and utilized in past research regarding health care and nursing (Sjöström & Dahlgren, 2002) and understanding physical activity in pre-operative bariatric patients (Wiklund et al., 2011):

1. *Familiarization:* the responses were read through multiple times to gain an overall impression and for clarity.
2. *Condensation*: Any statements made by participants about self/society were extracted in order to provide a concentrated and representative version of the dialogue.
3. *Comparison*: the obtained quotes were studied with each other in order to find sources of variation or agreement.
4. *Grouping:* similar quotes were grouped for initial categorization.
5. *Articulating:* Several attempts were made and revised to combine the group similarities into categories of description to extract the essence of the quotes within each group.
6. *Labeling:* the categories were named to reflect their essence.
7. *Contrasting:* in order to gain unique view of each category, the categories of description were compared with each other for similarities and differences and ultimately labeled in this final step.

Participant responses to the question, "What else you would like to tell us about your bariatric surgery experience?" were combined into a master document and organized systematically according to emerging broad categories. In addition to the 7 steps of analysis, categories of description were based on three principles described by Marton (1986). These

include—1) categories should emerge from participant responses; 2) categories are not distinguished as "all or nothing", but instead distinguishable; and 3) responses needed to be explicit to be categorized. The researchers employed an iterative process in the analysis of coding categories. Comparing and analyzing patterns assisted with understanding how coding categories were alike and how they were different. After transcription, each response was printed for clarity and the process of grouping responses for emerging categories were manually generated in order to ensure vital information was complete and considered in this study. The process of articulating allowed the researchers to provide direct and indirect information to support potential patterns and participants' experiences. In addition, post-it notes of various colors aided in identifying categories of description. The first transcript reading of responses assisted in developing initial categories, and then the second reading was conducted to formally start the process of comparison systematically using colored post-it notes to group related data (Hays & Singh, 2011). The subsequent transcript readings of responses aided in identifying new categories of description while using the contrasting process and finally the lists of categories were merged into one list, which constituted the final categories of description presented in an "outcome space" (Marton, 1986).

CHAPTER IV. OLDER ADULTS FIGHTING OBESITY WITH BARIATRIC SURGERY: BENEFITS, SIDE EFFECTS AND OUTCOMES[1]

Abstract

The aging population is growing exponentially worldwide. Associated with this greater life expectancy is the increased burden of chronic health conditions, many of which are exacerbated by the continued rise in obesity. In the United States, the prevalence of obesity in adults aged 60 years and older increased 23.6% to 37% in 2010. Objectives: This review examines bariatric surgery as a treatment option for obese adults > 60 years old. The most common types of weight-loss surgery are laparoscopic adjustable gastric banding, vertical sleeve gastrectomy, Roux-en-Y gastric by-pass, and the duodenal switch. Methods: A comprehensive literature search found 349 articles that referred to bariatric surgery in older adults. Of these, 70 relevant articles on bariatric surgery for older adults were utilized for this article. Results: Weight-loss surgery procedures were found equally safe for both older adults and their younger counterparts. Pre-surgical psychological assessment is critical for positive outcomes for older adults. Benefits of bariatric surgery include a decrease in comorbidities, chronic disease risk, and medication use coupled with improved mobility and quality of life outcomes. Side effects include surgical failure, changes in psychological status, and increased physical and mental stress. Conclusions: Bariatric surgery can offer patients an effective and long-lasting treatment for obesity and related diseases. There does not appear to be any one bariatric procedure that is recommended for older adults, so individual needs should be taken into consideration when exploring options. Costs range from US$17,000 for laparoscopic procedures to US$26,000 for

[1] This work previously appeared: Marihart, C. L., Brunt, A. R., & Geraci, A. A. (2014). Older adults fighting obesity with bariatric surgery: benefits, side effects, and outcomes. *SAGE Open Medicine*, *2*. doi: 2050312114530917. The material in this chapter was co-authored by Cindy Marihart (CM), Angela Geraci (AG) and Ardith Brunt (AB). CM and AG identified the pool of articles used for the review. CM wrote the article and created the table, AG created an outline and assisted with revisions. AB served as final proofreader.

open gastric surgeries. Estimated savings on healthcare costs start accruing within three months of surgery making bariatric surgery a serious cost saving consideration.

Introduction

This review examines bariatric surgery as a treatment option for obese adults ≥ 60 years old. The prevalence of obesity in older adults is rapidly expanding due to the aging of the baby boomer generation. Estimates of obesity in older Americans, increased from 9.9 million (24%) in 1990 to 14.6 million (32%) in 2000 to 22.2 million (37%) in 2010 (Salihu, Bonnema, & Alio, 2009). Since the baby boomers, those born between 1946-1964, are reaching their sixth decade heavier than previous generations, there is a public health concern that these overweight adults will become obese leading to greater risk of chronic disease (Leveille, Wee, & Iezzoni, 2005). The baby boomers weighed more and became obese at younger ages than previous generations (Zevin, Aggarwal, & Grantcharov, 2012). When the silent generation members, those born between 1926-1945, were aged 35-44 years, 14 to 18% were obese, but when the baby boomers were that age, those percentages doubled to 28-32% (Zevin et al., 2012)

Given the increased obesity rates for older adults, increased life expectancy does not necessarily mean an increase in healthy years (Han, Tajar, & Lean, 2011; Mathus-Vliegen, 2012). Instead, obese elderly may be facing additional years of discomfort, lack of mobility, and chronic ill health (Mathus-Vliegen, 2012; Mathus-Vliegen et al., 2012). The most common obesity related chronic diseases are type II diabetes, hypertension, heart disease, stroke, certain types of cancers, metabolic syndrome, respiratory disease, sleep apnea, fatty liver disease, osteoarthritis, gall bladder disease, pulmonary embolism, gastro-esophageal reflux disease (GERD), urinary incontinence, chronic renal failure, gout, and depression (Zamosky, 2013).

A literature search was conducted to retrieve relevant articles on bariatric surgery for older adults using EBSCO, MEDLINE, PROQUEST and WEB of SCIENCE with the forward option. A total of 349 articles were evaluated and 72 were deemed relevant and utilized for this review. Relevant articles described various types of weight loss surgery with the benefits and side effects, postoperative changes in co-morbidities and quality of life outcomes, and costs of surgery with related cost savings after surgery. See Table 4.1.

Types of Bariatric Surgery

Even though obesity is very difficult to treat with lifestyle changes, the medical community continues to encourage people to lose weight by diet and exercise (Zamosky, 2013). As a result of these recommendations, overweight and obese people attempt multiple diets, medications, and exercise regiments resulting in limited success over the long-term (Dorman, Abraham, et al., 2012; Neff, Olbers, & Le Roux, 2013; Zamosky, 2013). Increasingly, a viable option for obese patients has been surgery as a means to aid weight loss (Han et al., 2011; Mathus-Vliegen, 2012; Mathus-Vliegen et al., 2012; Zamosky, 2013; Zevin et al., 2012). Bariatric surgery that either restricts caloric intake or absorption has been found as the most effective method to lose weight and maintain a healthy lifestyle (Adams et al., 2007;Mathus-Vliegen et al., 2012; Zamosky, 2013; Zevin et al., 2012). There are various bariatric procedures available (Neff et al., 2013) and generally, the more complex the procedure, the greater the weight loss. But more complex/extensive surgery also has greater complications with higher morbidity and mortality rates (Dorman, Abraham, et al., 2012). In the order of frequency performed, are the Roux-en-Y gastric bypass (RYGB), laparoscopic adjustable gastric banding (LAGB), and vertical sleeve gastrectomy (VSG) (Figure 4.1). Biliopancreatic diversion, with a

duodenal switch (BPD-DS)] is least commonly performed but is often a consideration for extremely obese individuals (Neff et al., 2013).

Table 4.1. *Bariatric Key Findings for Patients Age 60 and Over*

Author/Year	Number of participants >60	Key findings
Adams et al. (2007)	7925 surgery group vs. 7925 control group, 3 age ranges 33-44, 45-54 & ≥ 55	No significant difference in age groups. Indicated that patients who have RYGB had decreased long-term mortality from any causes and from disease specific causes but have increased mortality from non-disease causes as compared with control subjects.
Dorman et al. (2012)	43,378 N with 1994 > 65	Patients > 65 did not experience major complications for either open or laparoscopic procedures but likely to have a longer length of hospital stay for either procedure.
Dunkler-Blatter et al. (2007)	76 > 60 and 989 < 60	Same length of stay of 2.9 days in hospital. Significant improvement for diabetes and hypertension after RYBG. Weight loss was less but greater reductions in medications.
Hallowell et al. (2007)	46 > 60 31 Medicare	No difference was found in the occurrence of complications in Medicare patients and patients > 60 years old. Results indicate that bariatric surgery should not be denied based on age or Medicare status.
O'Keefe et al. (2010)	197 > 65	Weight loss surgery is effective in patients > 65 years of age, producing EWL, reduction in daily medication use and morbidities.
Perry et al. (2008)	476 > 65	Bariatric surgery appears to increase survival even in high risk Medicare population. Diagnosed prevalence of weight-related co-morbid conditions declined after bariatric surgery.
Quebbemann et al. (2005)	27 > 65-73	Bariatric surgery van be performed safely in patients > 65. RYGB procedure is significantly more effective than LAGB.
Sugerman et al. (2004)	83 > 60	Bariatric surgery was effective for older patients with low morbidity and mortality. Older patients had more pre and post-operative co-morbidities and lost less weight than younger patients. But weight loss & improvement in co-morbidities in older patients were clinically significant.
Van Rutte et al. (2013)	73 for 55-59 50 for 60-64 12 for ≥65	Laparoscopic sleeve gastrectomy (LSG) as a primary treatment for older morbidly obese is an effective and relatively safe procedures in terms of weight loss and remission of co-morbidities with an acceptable low complication rate.
Varela et al. (2006)	1339 > 60	Older adults had longer lengths of stays in hospitals but bariatric surgery is considered as safe as other gastrointestinal procedure. Mortality is better than expected.
Wool et al. (2009)	47 > 50-59 males 13 > 60 males	Despite a higher early morbidity rate, obese males > 60 years perform as well as male patients 50-59 years with respect to excess weight loss, mortality. Length of hospital stay and improvement of diabetes at 1 year postoperatively.
Yuan et al. (2009)	27 > 65 males	Weight loss and mortality similar to younger males. Older males had slightly better resolution of both hypertension and diabetes.

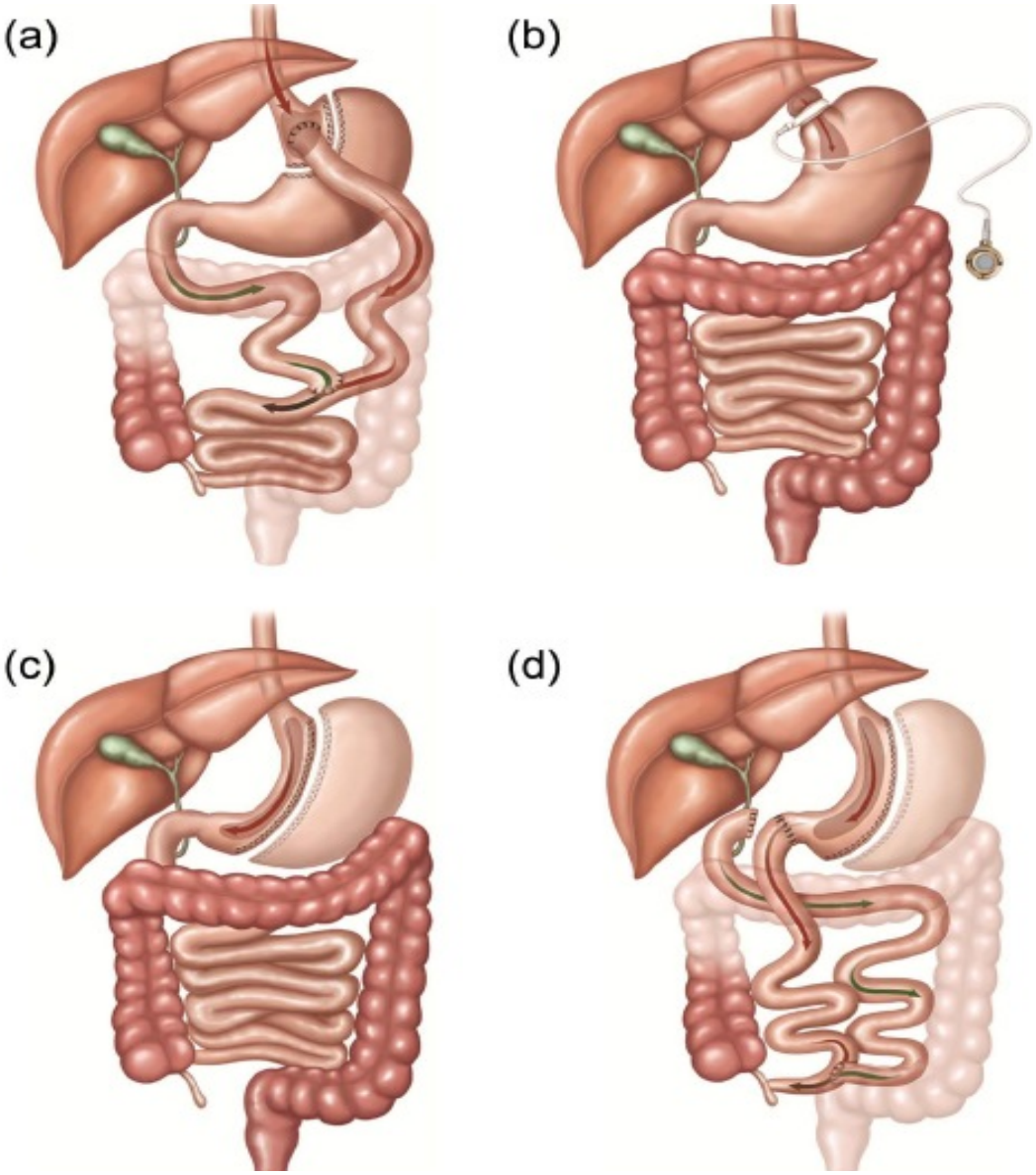

Figure 4.1. Most Common Types of Bariatric Surgery (Neff et al., 2013)
Note. (a) Roux-en-Y gastric bypass, (b) laparoscopic adjustable gastric banding (LAGB), (c) vertical sleeve gastrectomy (VSG) and (d) Biliopancreatic diversion, with a duodenal switch.

RYGB. RYGB is the most common type of weight loss surgery worldwide and is considered permanent (Buchwald & Oien, 2013). The stomach is divided into two sections, the upper part is a small pouch which holds about 1-2 ounces of food initially (Buchwald & Oien, 2013). The pouch is connected to the jejunum using a Y-shaped limb of the small intestine

bypassing the duodenum (Smith, Schauer, & Nguyen, 2011). Gastric and pancreatic secretions as well as bile mix with chime at the juncture of the jejunum and the duodenum (Smith et al., 2011). This procedure permanently changes how food is digesting resulting in fewer calories and nutrients being absorbed (Perry, Hutter, Smith, Newhouse, & McNeil, 2008). Weight loss is swift and dramatic, usually 50% of excess weight loss (EWL) in the first six months post-surgery, but may continue for up to two years (Scott & Batterham, 2011). Long term RYGB results show many patients keep weight off for 10 years or longer (Sjöström et al., 2012). As an added benefit of the rapid weight loss, health conditions affected by obesity such as diabetes, high blood pressure, high cholesterol, arthritis, sleep apnea, heartburn and other conditions often improve quickly (Chakravarty et al., 2012; Jáuregui-Lobera, 2013; Perry et al., 2008; Poirier et al., 2011).

Nevertheless, all is not necessarily without challenges. RYGB impairs the body's ability to absorb calories, dramatically increasing the risk for nutrient deficiencies (Neovius et al., 2012). The most common nutrient deficiencies after RYGB include the vitamins thiamin, vitamin B-12 and D, and the minerals iron, copper, and calcium (Adams et al., 2012). Deficiencies of these nutrients can lead to anemia, fatigue, and osteoporosis; therefore, RYGB patients should plan to take vitamin and mineral supplements the rest of their lives (Jáuregui-Lobera, 2013; Saltzman & Karl, 2013). Thiamin deficiency has occurred after all bariatric procedures and can be present within weeks or years after surgery (Saltzman & Karl, 2013). Wernicke's encephalopathy is related to severe thiamin deficiency resulting in cognitive dysfunction and eye disorders such as nystagmus and ocular palsies (Saltzman & Karl, 2013). Vitamin B-12 deficiency results from an intolerance to animal protein after RYGB and lack of intrinsic factor; therefore, monthly B-12 injections are recommended (Saltzman & Karl, 2013).

Vitamin D deficiency is a problem for 25% to 75% of bariatric patients with many having this deficiency preoperatively. Calcium absorption appears to be diminished possibly due to bypassing the duodenum and lack of Vitamin D (Saltzman & Karl, 2013). Resolving iron deficiency after RYGB can be a complicated issue because oral supplements are not absorbed; therefore, iron must be given intravenously (Saltzman & Karl, 2013). Copper deficiency is also present after RYGB, secondary to iron deficiency; copper status should be investigated as a source of anemia unresponsiveness to other nutrients (Saltzman & Karl, 2013).

RYGB is associated with other side effects such as an increased risk of dumping syndrome in which food is "dumped" from the stomach into the small intestine too quickly before it has been adequately digested (Adams et al., 2012; Hammer, 2012; Myers et al., 2012). Typically, this occurs when eating too many simple carbohydrates which can lead to diarrhea (Heinlein, 2009). Another long-term complication after RYGB is bone loss, which has been greater than with nonsurgical methods of weight loss (Berarducci, 2007; Hammer, 2012). Other potential risks include an increased incidence of hernias and gallstone formations, which can develop post-surgery and require surgical intervention to repair (Adams et al., 2012). Finally, there is a 1% mortality rate with the RYGB surgery (Benotti et al., 2013).

LAGB. LAGB is considered the least invasive and safer than the gastric bypass (Angrisani, Lorenzo, & Borrelli, 2007). Benefits of using LAGB are that recovery is quicker, hospital stays are shorter, and the surgery can be reversed (Angrisani et al., 2007; Chakravarty et al., 2012; Neff et al., 2013; Tice, Karliner, Walsh, Petersen, & Feldman, 2008). LAGB uses an inflatable silicone elastic band to squeeze the stomach into two sections: a smaller upper pouch and a larger lower section. The two sections are still connected, however, the channel or "bottleneck" between them is very small which slows down the emptying of the upper pouch

(Tice et al., 2008). Because LAGB physically restricts the amount of food consumed, it is a successful method in losing weight. However, weight loss is less dramatic and furthermore, weight is more likely regained over time (Thornton, Rozen, So, Kaplan, & Wilkinson, 2009). A common side effect of LAGB is vomiting which is often a result of eating too much too quickly (Chakravarty et al., 2012). If the band is too tight, acid reflux can result (Scott & Batterham, 2011; Spivak, Abdelmelek, Beltran, Ng, & Kitahama, 2012). Complications with the band itself include slipping out of place, becoming loose, or leaking (Thornton et al., 2009). Sometimes further laparoscopic surgeries are necessary to re-position the band or repair a band leak. Follow-up visits are also required in order to "tighten or loosen" the band to fine-tune how fast food empties from the upper pouch into the residual stomach (Allen, 2007). The process can result in weight fluctuations. LAGB has a 50% failure rate in the long term, as defined by poor weight loss and percentage of band removal (Spivak et al., 2012). Reasons for band removal ranged from inadequate weight loss (76%), gastric pouch dilation (64%), intolerance (21%), and band slippage (12%) (Spivak et al., 2012).

VSG. About 75% of the stomach is surgically removed in the irreversible VSG procedure (Adams et al., 2007), usually laprascopically (Scott & Batterham, 2011). What remains of the stomach is a narrow tube or sleeve, which provides for the normal process of stomach emptying and the pyloric valve remains intact. Not only is the appetite reduced, but also consuming very small amounts of food generate early and lasting satiety (Benaiges et al., 2011). Because the small intestine is unchanged (not shortened), VSG does not usually affect the absorption of food, so nutritional deficiencies are less of a problem compared to RYGB or BPD-DS (Scott & Batterham, 2011). In people with very high body mass index (BMI), VSG as a stand-alone procedure results in an average weight loss of greater than 50% of EWL. In patients with very

high BMI, the VSG may be followed by a modified RYGB or BPD-DS if significant weight loss is still needed. Since many adults who are morbidly obese have multiple co-morbidities, RYGB or BPD-DS may be too risky as an initial procedure (Benaiges et al., 2011). Usually, 12-18 months post-VSG, once the patient's health has improved and some weight has been lost, a second surgery may be undertaken (Aurora, Khaitan, & Saber, 2012; Benaiges et al., 2011; van Rutte, Smulders, de Zoete, & Nienhuijs, 2013).

Since VSG is a relatively new procedure, long term benefits and risks are still being evaluated. Typical surgical risks such as infection and blood clots apply; moreover, the sleeve itself can have leakage (van Rutte et al., 2013). Leakage occurs in less than 2.4% of patients for all sleeve procedures which can be successfully treated by operative or percutaneous drainage and endoscopic stenting (Aurora et al., 2012). Sleeve leakage symptoms include fever, pain in chest/shoulder area, heart palpitations, dizziness, nausea and vomiting (Aurora et al., 2012). VSG is associated with greater weight loss than LAGB but subsequent weight gain has been seen in nearly all studies where follow-up exceeds 5 years (Aurora et al., 2012; Caiazzo & Pattou, 2013).

BPD-DS. BPD-DS or more commonly referred to as the "duodenal switch" is a more complicated, invasive version of the RYGB and is performed less frequently (Hedberg & Sundbom, 2012; Mitchell et al., 2009). Even though as much as 70% of the stomach is removed during the BPD-DS, the remaining pouch is still larger than those formed during RYGB or LAGB (Mitchell et al., 2009; Nilsson, Hedberg, & Ohrvik, 2011). As a result, larger meals can be consumed in a sitting; however, there is also a greater, more serious risk of nutritional deficiencies (Dorman, Rasmus, et al., 2012; Ziegler, Sirveaux, Brunaud, Reibel, & Quilliot, 2009). Since much of the small intestine is bypassed, digestive enzymes cannot mix with food until it reaches the distal ileum (Nilsson et al., 2011; Prachand, Ward, & Alverdy, 2010). The

need for dietary supplements is higher among patients with BPD-DS compared to RYGB (Hedberg & Sundbom, 2012; Ziegler et al., 2009).

This surgery both restricts intake and reduces absorption area thereby resulting in rapid weight loss with an average long-term EWL of 70% to 80% (Dorman, Rasmus, et al., 2012; Hedberg & Sundbom, 2012; Mitchell et al., 2009; Prachand et al., 2010). In addition to the rapid weight loss, remission rate for type II diabetes is impressive at 100% within one year of surgery (Iaconelli et al., 2011). Co-morbidities such as hypertension, hyperlipidemia, and cardiovascular disease were also significantly reduced (Dorman, Rasmus, et al., 2012; Iaconelli et al., 2011; Prachand et al., 2010). Even with all these positive outcomes, BPD-DS is not without risks. BPD-DS poses many of the same risks as RYGB, including dumping syndrome, GERD, gallstone formation and hernias (Prachand et al., 2010). Comparing BPD-DS with RYGB, post-surgery BPD-DS required longer hospital stays and more frequent early reoperation than RYGB (Hedberg & Sundbom, 2012). Nevertheless, overall there were no differences in late reoperation rates between the two groups (Hedberg & Sundbom, 2012; Nilsson et al., 2011). Despite the complications associated with BPD-DS, one study reported better weight and co-morbidity control than RYGB, with even more pronounced benefits among super-obese patients (Hedberg & Sundbom, 2012; Nelson, Blair, & Martin, 2012; Prachand et al., 2010). Because of infection, sepsis, and nutrition deficiencies, mortality rates are greater, ranging from 2.5% to 5% regardless of age (Hedberg & Sundbom, 2012; Prachand et al., 2010).

Bariatric Surgery Candidate Selection

The medical community recommends that surgical treatment of obesity should only be considered after all nonsurgical methods are exhausted (Yermilov, McGory, Shekelle, Ko, & Maggard, 2009). Potential bariatric patients are required to have attempted and failed several

traditional diet methods (van Hout, van Oudheusden, Krasuska, & van Heck, 2006). In 1991, the National Institute of Health (NIH) first established bariatric patient selection guidelines which included a BMI of 40 or more or a BMI of 35-39 with one or more obesity related co-morbidities for people ages 18 to 50 (Yermilov et al., 2009). Age restrictions were initially in place because it was believed that the health risks of bariatric surgeries surpassed beneficial outcomes for aging patients (Pratt, McLees, & Pories, 2006; Quebbemann, Engstrom, Siegfried, Garner, & Dallal, 2005). In 2006, the NIH recommendations changed and Medicare reversed their policy to deny bariatric requests based solely on age and age restrictions were eliminated (Henrickson, Ashton, Windover, & Heinberg, 2009; Yuan et al., 2009).

Outcomes of Bariatric Surgery for Older Persons

Bariatric surgery often results in effective and enduring weight loss with complete resolution or significant improvement in obesity-related co-morbidities (Buchwald, 2005; Wool et al. 2004). After the Medicare authorized approval of bariatric surgery for older adults in 2006, 2.7% of all bariatric operations were performed on patients older than 60 years old in that year (Varela, Wilson, & Nguyen, 2006). Younger patients may have a greater EWL and have a more complete resolution of their co-morbid conditions, but older people reduced the number of prescribed medications that they took (Adams et al., 2012: O'Keefe et al., 2010). Age did not influence the rate of occurrence of postoperative complications and outcomes between older and younger patients (Felix & West, 2013; Hallowell et al., 2007;Sjöström et al., 2012; Sugerman et al., 2004).

Physical outcomes of bariatric surgery have steadily improved during the past decade (Dimick, Nicholas, Ryan, Thumma, & Birkmeyer, 2013). The most common obesity related chronic diseases are type II diabetes, hypertension, heart disease, stroke, certain types of cancers,

metabolic syndrome, respiratory disease, sleep apnea, fatty liver disease, osteoarthritis, gall bladder disease, pulmonary embolism, GERD, urinary incontinence, chronic renal failure, gout, and depression which can all be improved by weight loss from bariatric surgery (Poirier et al., 2011). Bariatric surgery for older patients has been shown to be safe and effective for EWL and in improvement of obesity co-morbidities especially type II diabetes and blood pressure with trends in greater improvement for older patients than younger patients after RYGB (Dunkle-Blatter et al., 2007). Individuals who underwent bariatric surgery had a significantly reduced number of total and fatal cardiovascular events compared with matched obese controls that did not undergo surgery (Sjöström et al., 2012). Further, cancer rates have been reduced to nearly 50% in post surgical bariatric patients (Sjöström et al., 2012).

Quality of life measures and physical mobility. Regardless of age, improved mobility, reduced co-morbidities, pain reduction, and enhanced psychological functioning such as improvements in mood, self-esteem, social functioning, and sexuality led to improved quality of life enrichment in bariatric patients (Folope et al., 2008; G. van Hout & van Heck, 2009). Ten years after weight loss surgery, patients had significantly better health perceptions, social interactions, psychosocial functioning, and reduced depression (Karlsson, Taft, Rydén, Sjöström, & Sullivan, 2007). Improved mobility and less medications alone led many participants who underwent bariatric surgery to state they had experienced improved mood, regardless of whether all weight-loss goals were met, and would opt to have the surgery again (Dunkle-Blatter et al., 2007; Folope et al., 2008; Karlsson et al., 2007; G. van Hout & van Heck, 2009).

Wheelchair-bound older patients were often fully ambulatory within months post-surgery (Sugerman et al., 2004). Even modest weight-loss improved overall physical functioning of older adults (Sugerman et al., 2004). For example, patients with lower extremity arthritis experienced

reduced knee and hip pain (McTigue, Hess, & Ziouras, 2006; G. van Hout & van Heck, 2009). Many obese patients who have type II diabetes experience normalization of blood sugars within days post-surgery (Dunkle-Blatter et al., 2007). Patients can frequently stop taking diabetes medications before leaving the hospital after surgery (Dunkle-Blatter et al., 2007). Being able to reduce or eliminate daily diabetes glucose testing and insulin injections leads to improved quality of life. Currently, research on glucose metabolism is underway to better understand this outcome phenomenon (Dunkle-Blatter et al., 2007; Saeidi et al., 2013). However, nutrient deficiencies negatively affect quality of life by requiring extra doctor visits, vitamin supplements, iron infusions, B-12 injections and physical symptoms of lower energy (Jáuregui-Lobera, 2013; Saltzman & Karl, 2013).

Food intolerances and physical mobility challenges. Food intolerance and lack of vitamin and mineral absorption can be a problem for all patients after weight loss surgery, regardless of type and can result in osteoporosis and anemia (Mathus-Vliegen et al., 2012; Ziegler et al., 2009). This can be a more critical concern for the elderly. Since there is an increased risk of bone fractures for those who developed osteoporosis, recovery from hip fracture can prove to be problematic for aging patients (Dunkle-Blatter et al., 2007). If left untreated, low intake of heme iron foods can increase the risk of anemia which can lead to frailty and malnutrition in older patients (Heuberger, 2011). Patients report that they have a sense of control of food intake that they never had before but certain food intolerances such as meat and coarse vegetables can make choosing foods difficult (Hensrud & Klein, 2006; Ziegler et al., 2009).

Since weight loss post-surgery is initially rapid, losing muscle and fat mass is a valid concern in older patients. As one ages, the loss of muscle mass, known as sarcopenia, usually happens as part of the aging process (Berarducci, 2007). But losing additional muscle mass

through rapid weight loss has the potential to result in more mobility issues for older adults (Berarducci, 2007). Post-op diet and exercise regimes are recommended for all surgeries and all patients, but certain health challenges may make it difficult for older adults to adhere to strict programs (Gremeaux et al., 2012). Obesity was once believed to be bone protective, but more recent research has introduced evidence of greater risk for metabolic bone disease due to lack of vitamin D and inadequate calcium intake, sedentary lifestyle, chronic dieting, and underlying diseases (Berarducci, 2007). After bariatric surgery, the risk of bone-related diseases increases due to restrictive intake, malabsorption, and poor compliance to vitamin and mineral supplements and dramatic weight loss (Berarducci, 2007; Mathus-Vliegen, 2012; Mathus-Vliegen et al., 2012; Poirier et al., 2011).

Costs of Bariatric Surgery

Healthcare utilization and healthcare costs for the morbidly obese are 81% above those of the nonobese population (Hensrud & Klein, 2006). Analysis of bariatric surgery cost of 3651 patients showed a strong return on investment up to five years post operatively (Cremieux et al., 2008). Estimated costs in 2010 of laparoscopic and open gastric bypass are $17,000 and $26,000, respectively (Felix & West, 2013). Even with these high surgical expenditures, cost savings start accruing by the third post-operative month (Bradley & Sharma, 2006). The short term return on investment associated with bariatric surgery is consistent with decrease in multiple co-morbid conditions, including diabetes, coronary artery disease, hypertension and sleep apnea (Crémieux et al., 2008; Klein, Ghosh, Cremieux, Eapen, & McGavock, 2011). The cost reductions in these diseases take into account prescription drug usage, hospital stays, and physician visits (Cremieux et al., 2008). Type II diabetes is greatly improved by bariatric surgery (Klein et al., 2011) and estimated annual costs of managing a diabetes patient ($13,243) are five times more than a

patient without diabetes ($2,560) (Campbell et al., 2010). People age 65 years and older represent 10.9 million Americans. Approximately 27% of all people in this age group have diabetes but not all of these older dietetics will necessarily improve with bariatric surgery. It is estimated that one third of all Medicare dollars are spent on the cost of care of people with diabetes (Neovius et al., 2012).

Conclusion

Bariatric surgery can offer patients an effective and long lasting treatment for obesity and its related diseases. There does not appear to be any one bariatric surgical procedure that is recommended for older adults, so individual needs should be taken into consideration when exploring options. Literature is scarce on the long-term success of older adults and bariatric surgery. This may be due to the NIH removal of age limitations and Medicare inclusion of bariatric surgery since 2006. A number of studies that have demonstrated that the surgery is safe for the aging population; additionally, comorbidities improve. Many other research opportunities remain. Research questions should delve into motivating older adults and their younger counterparts to choose bariatric surgery and the effects of that surgery on their relationships. Questions remain concerning bariatric surgery side effects on social relationships, the role of social support, quality of life issues post-surgery, and predictor differences for bariatric success in older versus younger adult patients. Other questions might include the effect of retirement as a help or hindrance on bariatric surgery recovery, older patients and diet adherence, the effect of nutritional deficiency complications, or weight regain concerns. Specific for older adults, research questions may include the effects of muscle and bone loss as a result of bariatric surgery and the long- term outcome for mobility for older adults.

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CHAPTER V. THE PAIN OF REGAIN: PSYCHOSOCIAL IMPACTS OF WEIGHT REGAIN AMONG LONG-TERM BARIATRIC PATIENTS

Abstract

Bariatric surgery is an increasingly popular solution to reversing the effects of obesity. This study investigated the psychosocial influences to participants (n = 667) on weight regain following bariatric surgery. A mixed methods approach was utilized. Quantitative inquiry used multiple linear regression to analyze weight regain. The final set of six predictors produced a statistically significant SMC of .276 ($F_{6, 593}$ = 37.612, p < .001), with an adjusted SMC of .268. The average amount of weight regain can be expected to decrease by approximately four pounds for each increase of one point on adhering to the recommended post-operative diet. Those who have larger differences from their lowest to highest weights can generally expect to regain slightly more weight. Two qualitative themes on weight regain emerged: 1) weight regain after bariatric surgery is likely (n = 129) and 2) bariatric follow-up and support (n = 118). Results reveal psychosocial events influence individuals even by a small weight regain, which can overshadow the benefits of bariatric-surgery.

Introduction

Obesity is a complex disease affecting millions of Americans. More than two-thirds of adults (68.6%) are considered overweight or obese, constituting more than 78 million American men and women (Flegal, Carroll, Kit, & Ogden, 2012). Of this staggering number, it is estimated that 15 million Americans are considered severely obese (ASMBS, 2015 “Disease of obesity”) and cannot treat their disease with lifestyle changes alone. Increasingly, individuals elect to undergo bariatric surgery after traditional “eat less, move more” approaches yield limited long-term results to achieve lasting weight loss and improvement of obesity-related chronic conditions

(Dorman, et al., 2012; Neff et al., 2013; Zamosky, 2013).

However, questions still arise on long-term bariatric surgery success and its effect on weight loss maintenance, and perhaps one of the greatest fears of post-operative patients: weight regain after vast weight loss (Buchenwald et al., 2004; Neto et al., 2012). Past research indicates that about a year and a half to two years post-surgery, weight loss from surgery stops, and a significant number of individuals begin the regain the weight they initially lost (Buchenwald et al., 2004; Jeffrey et al., 2000; Karlsson et al., 2007; Shah, Simha, & Garg, 2006). Contributing psychosocial factors to weight regain are varied and may include disinhibition of eating, grazing behavior (continuous snacking throughout the day), food cravings, poor well-being, poor self-concept, lack of planned exercise, not following aftercare recommendations, and social support (Bocchieri, Meana, & Fisher, 2002; Bond, Phelan, Leahey, Hill, & Wing, 2009; Buchenwald et al., 2004; Geraci, Brunt, & Marihart, 2014; Yanos et al., 2014).

Disinhibition of eating may be an important factor leading to weight regain (Kofman, Lent, & Swencionis, 2010). Disinhibition is the tendency to overeat in response to different stimuli, and can occur in a variety of circumstances such as when an individual is presented with a selection of appetizing foods in a social environment, is under emotional distress, or due to life's daily challenges (Kofman et al., 2010; Niemeier et al., 2007). Susceptibility to cues that trigger overeating may increase the potential for regaining weight regardless if the person lost weight through surgery or nonsurgical means (Bond et al., 2009). Bond and colleagues (2009) found that surgical participants had less physical activity, greater fast food and fat intake, less dietary control, greater depression, and greater stress at both entry and one year post-operative than the nonsurgical participants.

Another study, which evaluated RYGB outcomes, indicated that 47% to 50% of participants reported breaking away from post-surgery dietary recommendations and decreased physical activity despite typically participating in an intensive pre-operative educational program and having access to educational resources as part of the post-operative plan (Tejirian, Jensen, Lewis, Dutson, & Mehran, 2008). The same study also noted that 35% of participants reported a 15% or more weight regain and the bariatric clinic's inability to maintain long-term care follow-up past the first 4 months post-surgery was an ongoing challenge (Tejirian et al., 2008).

Past and recent research note the continuing lack of long-term follow-up to assess and support patients' well-being, especially when, at 18 months post-surgery, a significant portion of the bariatric population begins to regain weight (Bocchieri et al., 2002; Jeffrey et al., 2000; Karmali et al., 2013; Kubik, Gill, Laffin, & Karmali et al., 2013; Puzziferri et al., 2014; Puzziferri, 2005; Yanos et al., 2014). Moreover, Puzziferri and colleagues (2014) conducted a comprehensive review of 184 systematic reviews regarding bariatric surgery outcomes and found that only three reviews reported studies greater than 5 years. In addition, none of the 184 reviews evaluated continuing post-surgery follow-up and the researchers postulated that the efficacy of bariatric surgery was overestimated due to undocumented parameters regarding follow-up (Puzziferri et al., 2014).

Past bariatric research regarding psychological and psychosocial outcomes such as depression and self-concept (self-esteem, self-confidence, and body image) report significant post-operative emotional and quality of life improvements in the first two years post-surgery (Herpertz et al., 2003; Hsu et al., 1998; Mamplekou, Komesidou, Bissias, Papastantinou, & Melissas, 2005; Puzziferri, 2005). Yet, there are conflicting results regarding the impact of these important psychosocial outcomes. Additional research conveys that most of these improvements

go hand-in-hand with weight loss and not all patients experience psychosocial gains due to post-surgical outcomes such as a lack of weight loss, weight regain, and loose, sagging skin (Bocchieri et al., 2002; Karmali et al., 2013; Kubik et al., 2013; Throsby, 2008; Yanos et al., 2014). One recent study focused on psychosocial and behavioral variables and found that about half of participants reported considerable weight regain (>20% of total weight lost) from the lowest weight achieved post-surgery and that many of the variables (night eating, protein intake, sweet avoidance, fluid intake, physical activity, depression, and post-surgery alcohol abuse) that envisaged weight regain were modifiable factors (Yanos et al., 2014).

Psychosocial factors such as depression, self-efficacy, and self-concept are emerging as critical variables, which impact the long-term effectiveness of bariatric surgery. One of the purposes of the present study was to gain an understanding of psychosocial variables and the influence they have on weight regain and post-bariatric follow-up.

Methods

This study used a mixed methods design, which is a procedure for collecting, analyzing, and "mixing" both quantitative and qualitative data at some stage of the research process within a single study, to attempt to understand a research problem fully (Creswell, 2014). The researchers used an embedded mixed methods cross-sectional study design (Creswell, 2014), where the quantitative data provided a general picture of long-term bariatric outcomes, while the qualitative data assisted in explaining statistical results by exploring participants' bariatric experiences. Priority was given to the quantitative method, because the quantitative research presented the majority of the data collection and analysis of the present study. Quantitative and qualitative data were collected concurrently through the distribution via postal mail or a web-based post-surgery questionnaire.

Participants

Upon approval from the university's Institutional Review Board, participants were recruited either from public bariatric support forums (*n*=133) or through a regional weight management center in the Midwest (*n*=534), which specializes in bariatric surgery. Participant criteria for inclusion included those who were at least 18-months post-operative and over the age of 18. Participants were recruited through both outlets regardless of gender, age, surgery type, ethnicity, or socioeconomic status. The final study sample included 667 participants (85.9% female) who ranged from 22-84 years of age (M=52.9). The majority of participants had the Roux-en-Y Gastric Bypass (RYGB) (81%). The researchers were only permitted to collect self-identified ethnicities from public support forums (85% White, non-Hispanic), but the Midwestern bariatric clinic comprises of a roughly 90% White, non-Hispanic population. Further demographic characteristics and self-reported anthropometrics are presented in Table 5.1 and Table 5.2.

Table 5.1. *Demographic Characteristics of Respondents*

Characteristic	*n*	%	Valid %
Age Groups			
Young (22 to 39)	116	17.4	17.4
Early Midlife (40 to 49)	148	22.2	22.3
Late Midlife (50 to 59)	179	26.8	26.9
Older (60 to 69)	146	21.9	22.0
Oldest (70+)	76	11.4	11.4
Total Responses	665	99.7	100.0
Surgery Type			
Bypass	538	80.7	81.0
Sleeve	101	15.1	15.2
Band	21	3.1	3.2
DS	4	.6	.6
Total Responses	664	99.6	100.0
Gender			
Female	573	85.9	85.9
Male	94	14.1	14.1
Total	667	100.0	100.0
Ethnicity			
African American	10	1.5	7.5
Asian	1	.1	.8
Hispanic	7	1.0	5.3
White Non-Hispanic	113	16.9	85.0
Other	2	.3	1.5
Total Responses	133	19.9	100.0
Level of Education			
Less than high school	9	1.3	1.4
High school/GED	149	22.3	22.4
Some college	300	45.0	45.0
College degree (or above)	208	31.2	31.2
Total Responses	666	99.9	100.0
Relationship Status			
Single	69	10.3	10.4
Married/Domestic Partnership	451	67.6	67.7
Divorced/Separated	107	16.0	16.1
Widowed	39	5.8	5.9
Total Responses	666	99.9	100.0

Note. Some characteristics may not add to total sample size due to non-response by some participants.

Table 5.2. *Self-reported Participant Anthropometrics (Pre-surgery and Current)*

Characteristic	*n*	*M*	*SD*
Age (years)	665	52.93	12.80
Time since surgery (months)	661	70.40	43.21
Weight on the day of surgery (lbs.)	666	284.42	55.88
BMI[a] on the day of surgery	665	46.41	7.63
Lowest weight achieved (lbs.)	665	165.06	39.33
Lowest BMI[a] achieved	664	26.88	5.53
Current weight (lbs.)	667	185.27	45.18
Current BMI[a]	666	30.18	6.35
Current post-surgery weight loss[b] (lbs.)	667	109.90	43.97
Max. post-surgery weight loss[c] (lbs.)	665	130.18	42.94
Current post-surgery regain[d] (lbs.)	665	20.15	21.28

[a] Body Mass Index (BMI) formula: weight (lbs.) / [height (inches)]^2 × 703
[b] Current weight loss formula: highest weight (lbs.) – current weight (lbs.)
[c] Max. weight loss formula: highest weight (lbs.) – lowest weight (lbs.)
[d] Regain formula: current weight (lbs.) – lowest weight (lbs.)

Procedures

The researchers utilized five online public bariatric forums, which each contain hundreds to thousands of members in various stages of the bariatric surgery process (pre-operative, peri-operative, and post-operative). Although the researchers may have posted recruitment notices with the web-based questionnaire link to online forums, personal contact with participants did not occur and it is unknown how many members actually viewed the recruitment notice. The notice was posted approximately once a week for 12 weeks. Data were collected using a web-based survey system (Qualtrics).

The Midwestern weight management center personnel used their patient database to identify potential participants meeting inclusion criteria and paper questionnaires were mailed with the option to complete the questionnaire online. The questionnaires were returned to the researchers containing no identifying information. A total of 2,520 questionnaires were mailed, with 178 returned by the post office for undeliverable addresses. A total of 534 paper questionnaires were completed and returned, constituting a 22.8% response rate. Data collection

concluded approximately 12 weeks after the paper questionnaires were mailed. These data were subsequently entered into a database and merged with the data collected online.

Instrument

After an exhaustive search, the researchers found no existing bariatric questionnaire that met their needs regarding long-term bariatric outcomes. The researchers, therefore, developed a bariatric questionnaire addressing various post-operative outcomes in long-term bariatric patients, including dietary adherence, health impacts, perceptions of surgical success, and other psychosocial dimensions. The questionnaire included 12 demographic items (i.e. age, height, four milestone weights, surgery type, and relationship status). The four milestone weights included highest weight before surgery, day of surgery weight, lowest weight achieved post-surgery, and current weight. This instrument consisted of 26 five-point Likert-scale items.

Prior to the start of study, the post-surgery questionnaire was reviewed by educational and health professionals for content and readability and revised as directed. In addition, the revised questionnaire was pilot tested with a sample of 12 bariatric patients to test for content validity. All quantitative data was analyzed using SPSS (version 22.0).

Qualitative data analysis and coding. In addition to the demographic and Likert-style items, the participants were asked to respond to one open-ended item at the end of the questionnaire: "What else you would like to tell us about your bariatric surgery experience?" Participant responses were combined into a master document and organized systematically according to emerging broad themes. The first author employed an iterative process in the development of coding categories. Comparing and analyzing patterns assisted with understanding how coding categories were alike and how they were different. After transcription, each response was printed for clarity and codes were manually generated in order to ensure vital

information was complete and considered in this study. Codes allowed the researchers to provide direct and indirect information to support potential themes and patterns. In addition, post-it notes of various colors aided in identifying themes. The first transcript reading of responses assisted in developing coding categories, and then the second reading was conducted to start formal coding in a systematic way using colored post-it notes to group related data (Hays & Singh, 2011). The subsequent transcript readings of responses aided in identifying new categories of information and the two lists were merged into one list, which represented the final codebook.

Qualitative data quality concerns. The researchers established trustworthiness through credibility, peer debriefing, and reflexive journaling. Establishing trustworthiness of the findings was utilized by engaging in peer debriefing of responses and through prolonged discussions during all phases of the study with peers and fellow researchers. Researcher reflexivity was engaged in by keeping a journal, which included the researchers' thoughts on participant responses and simultaneous data collection and analysis, which involved collecting and analyzing data simultaneously (Hays & Singh, 2011). Credibility may also be a concern during qualitative data collection. Data quality, meaningfulness, and interpretation were established through the authenticity of the collected data. Credibility was improved by using recollections of the researchers own experiences with bariatric surgery (reflexive journaling) and previous research and engagement with other bariatric patients.

Results

Quantitative Results

Descriptive statistics. The descriptive statistics for relevant anthropometric characteristics (regain, age, time since surgery, etc.) are provided in Table 5.2. Of particular

interest, the median for post-operative weight regain is 15 pounds (see Table 5.3 for additional percentile values).

Table 5.3. *Tukey's Five-Number Summary for Post-Operative Weight Regain (lbs.)*

Min	Q_1	Median	Q_3	Max
0	4	15	30	175

As can be seen in Figure 5.1, the observed distribution of regain values is clearly positively skewed. Note that this graph displays a roughly exponentially decreasing trend in the amount of post-operative weight regain.

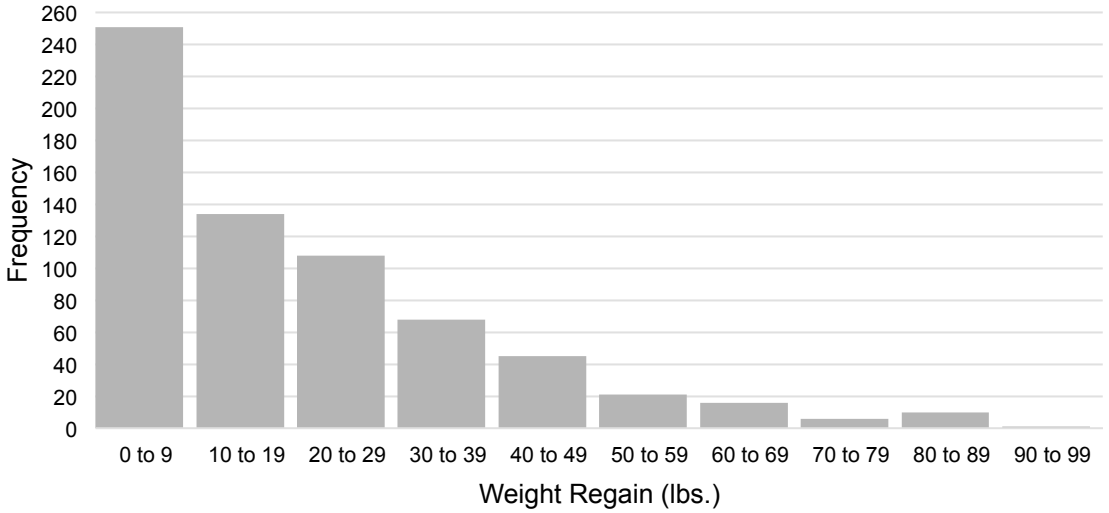

Figure 5.1. Histogram of Post-operative Weight Regain

Bivariate correlations. An initial exploratory analysis was conducted using simple bivariate correlations for post-operative weight regain with a number of key variables. As shown in Table 5.4, most of these variables had a significant correlation with weight regain. The exceptions were age, fluid intake, and an attitude item regarding the patients' feelings about the helpfulness of support groups.

Table 5.4. *Correlations with Weight Regain (lbs.)*

Variable	*r*	*n*
Age (years)	.011	663
Height (inches)	.120*	664
Weight at time of surgery (lbs.)	.188*	664
Maximum post-operative weight loss (lbs.)	.200*	665
Time since surgery (months)	.326*	659
Freq. of use of face-to-face support group	-.123*	650
Freq. of use of online support group	-.208*	644
Current amount of exercise	-.191*	659
Adherence to post-operative diet	-.322*	654
Relative amount of fluid intake	-.065	663
Relative amount of protein intake	-.107*	652
Relative amount of vitamin/mineral intake	-.096**	659
Self-concept /self-esteem	-.176*	654
Self-concept /appearance	-.322*	656
Self-concept/well-being	-.309*	652
Satisfaction with weight loss	-.277*	641
Satisfaction with surgery	-.305*	660
Improvement of depression	-.153*	390
Perceived changes in overall health	-.205*	660
Perceived changes in mobility	-.288*	657
Perceived changes in energy level	-.225*	659
Perceived changes in sleep patterns	-.182*	663
Retrospectively, would choose surgery again	-.189*	660
Improvement on outlook on life	-.219*	652
Feel better about the future	-.256*	647
Feel healthier	-.235*	654
Feel that support groups are helpful	-.180	109

* Sig. at .01

** Sig. at .05

Note. Variables measured on a five-point Likert scale unless otherwise indicated by units given in parentheses.

Multiple linear regression. A multiple linear regression analysis was conducted with weight regain as the outcome variable. The stepwise predictor-selection method was used in this study in order to build the most efficient model for the purposes of predicting weight regain. This analysis was based upon a sample of $n = 600$ respondents; some of the original 667 cases were ineligible for analysis due to missing data on one or more variables. This process began with an initial pool of 16 candidate predictor variables, which was trimmed to a final set of six predictors using stepwise selection (criterion for variable entry: $p \leq .05$; criterion for variable removal: $p \geq .10$).

The initial pool of variables were selected as the most likely influences on post-operative weight regain (especially long-term) based upon the current research literature. Obviously, the amount of time since surgery is an important factor (Ogden, Avenell, & Ellis, 2011; Puzziferri, 2005; Yanos et al., 2014). Past research has claimed that self-concept is an important influence in regain (Bocchieri et al., 2002; Kubik et al., 2013). This initial pool of candidate predictor variables include many of those shown in Table 5.4. However, since this is a predictive model, items that were themselves outcomes (e.g., satisfaction with weight loss) were excluded. Also, the items "feel that support groups are helpful" and "improvement of depression" were not included due to the high number of missing observations. Gender was added as categorical predictor.

A final set of predictors were selected after six stepwise iterations—namely, height, time since surgery, maximum post-operative weight loss, adherence to post-operative diet recommendations, self-concept/appearance, and self-concept/well-being. This final set of six predictors produced a sizable (and statistically significant) squared multiple correlation (SMC) of

.276 ($F_{6, 593} = 37.612$, $p < .001$), with an adjusted SMC of .268. No collinearity problems were detected among the predictors in the final model (maximum VIF = 1.5).

All six predictor variables retained in the final model were found to be statistically significant at the .01 nominal significance level (see Table 5.5). An inspection of the standardized regression weights (β) revealed that the most important (strongest) predictors for post-operative weight regain are adherence to post-operative diet recommendations and the amount of time since surgery. Also of interest is that self-concept/appearance and self-concept/well-being were retained in the model, while self-concept/self-esteem was not. Further, age was not retained in the model.

Table 5.5. *Intercept and Regression Weight Estimates from the Final Regression Model*

Model Term	*b*	SE	β	*t*	*p*
Intercept	3.815	14.664		.260	.795
Height	.615	.218	.103	2.821	.005
Time since surgery	.099	.018	.204	5.462	.000
Maximum post-operative weight loss	.081	.018	.167	4.551	.000
Adherence to post-operative diet	-3.969	.694	-.213	-5.716	.000
Self-concept/appearance	-4.351	.947	-.194	-4.594	.000
Self-concept/well-being	-2.469	.957	-.111	-2.579	.010

Note. Variables removed from the model were Age, Gender, Weight at surgery, Amount of exercise, Daily fluid intake, Daily protein intake, Daily vitamin intake, Freq. of use of face-to-face support group, Freq. of use of online support group(s), and Self-concept/self-esteem.

Qualitative Findings

Of the 667 participants that returned the questionnaire, 80% ($n = 533$) provided a narrative response to the following question: "What else would you would like to tell us about your bariatric surgery experience?" The breadth and length of narrative responses participants

provided varied exponentially from a couple of sentences to multiple handwritten pages attached to the original questionnaire, which ultimately resulted in 158 pages of narrative output. Moreover, since the question posed was so general, the variety in responses was diverse across many different topics regarding post-surgical outcomes. Analysis of all data, including quantitative items, narrative responses, and reflexive journaling were conducted to analyze and identify themes of the participants' experiences with weight regain and follow-up concerns post-bariatric surgery. The coding process of related responses to weight regain and surgical follow-up resulted in the emergence of two major themes from the narratives: 1) weight regain after bariatric surgery is likely (n = 129) and 2) continuing bariatric follow-up and support is needed (n = 118). For frequencies and examples of participant responses, see Table 5.6.

Table 5.6. *Qualitative Responses Related to Weight Regain and Bariatric Follow-up*

Major Themes and Subthemes	*n*	Examples
1. Regain after Bariatric Surgery is Likely	129	
• *Negative emotions associated with weight regain*	45	"I'm very unhappy that that I have put weight back on and even though I'm not close to my high weight, I feel like I look like I am and I have the same horrible feelings I had before my surgery."
		"Unfortunately, I have steadily gained weight the past year and a half, which [has] lowered my self esteem, I am depressed and don't want to be seen in public."
• *Self-blame*	31	"Hunger has returned with a vengeance…but I feel I failed the process by my own inability to adhere to a reasonable program of diet/exercise."
		"I still have issues eating the wrong things or grazing when I shouldn't…I do feel like I am failing because I have gained weight again."
		"I'm very dissatisfied with my with my weight loss because it's my fault I've gained…It's not easy for some of us to use the tool we were given. I always eat with my eyes…I'm a mess."
• *Confusion regarding regain*	28	"I eat hardly anything because I still vomit, yet I am gaining weight steadily."
		"I've gained 20-30 pounds in the last year or so…I am trying to figure out what I am doing wrong."
		"I didn't lose much weight. I think my body is meant to be fat. I don't eat much and I don't lose. I walk 5 miles a day and I never was able to get below 210 [lbs.]…so I have just given up."

Table 5.6. *Qualitative Responses Related to Weight Regain and Bariatric Follow-up* (continued)

Major Themes and Subthemes	*n*	Examples
2. Bariatric Follow-up and Support	118	
• *Lack of Education/ Feeling Unprepared*	41	"I hope that the research will take into account the duration of time that has passed since surgery. It would be a great asset if the Doctors would follow up on progress for than just a year…It would be very helpful." "I wish I was more prepared for the long-term [effects] (scar tissue, bowel blockages, vitamin malabsorption)…" "I have often said I wished there was more standardization with bariatric aftercare…why are some people told they can only have30 grams of carbs per day, and I am told that I have to have 120…"
• *Formal support groups cater to "newbies" (newly post-ops)*	29	"They seem to be overrun by pre-ops and people who are fresh out from surgery. I have heard the questions a million times…" "Face to face groups are newbies with stars in their eyes. The group leader minimizes my participation, because she does not want me to verbalize what it feels like to have gained back half my weight loss."
• *General barriers to support group engagement*	48	"I need a supportive environment, whether online or face to face meetings, but I live an hour away [from clinic area]." "I don't participate in support groups in person because of my work schedule and family schedule." "My support group disbanded."

Weight regain after bariatric surgery is likely. The overarching theme of the weight regain phenomena after bariatric surgery emerged from the narrative data as participants noted their problems with most restrictive procedures when restriction is diminished, causing the gastric pouch to stress (as with RYGB) or stretching of the gastric sleeve (following VSG). Upon further analysis, the major theme of regain after bariatric surgery had three subthemes emerge: (a) Negative emotions associated with weight regain, (b) Self-blame, and (c) Confusion regarding regain. Within this first major thematic category, a key subtheme participants most frequently reported was the negative emotions that were associated with personal weight regain. Specifically, participants perceived negative emotions surrounding their post-operative weight regain experiences. Emphasis appeared to be placed on descriptors related to self-esteem, self-confidence, and lack of assertion, which are believed to be important variables related to one's mood and self-efficacy (Bocchieri et al., 2002).

Another prominent subtheme that emerged was the concept that long-term bariatric patients "did it to themselves." Many participants noted the lack of willpower they had in regards to food, that they still struggle with food relationships, and/or that they "fell off track" in regards to post-surgical diet adherence. Many participants associated food as a means to cope and the challenge of finding new ways to channel emotions without turning to food (Bocchieri et al., 2002; Ogden et al., 2011). Finally lesser subthemes materialized in regards to confusion about regain (i.e. still "eat small amounts" yet battling regain, or the difficulty of trying to lose weight as a long-term post-op) and "other" regain responses, which may have just been a generally noting of gaining a certain number of pounds since the lowest achieved post-surgical weight or surgical failure (lap-band removal or RYGB reversal).

Continuing bariatric follow-up and support is needed. Another central theme that may have an adverse contribution to weight regain and self-efficacy following bariatric surgery is the importance of long-term bariatric follow-up and support. One of the major subthemes that may serve the bariatric surgical community is the notion that many participants reported feeling that there was "a lack of education" by their surgical team regarding preparation for potential long-term issues including vitamin and mineral deficiencies, weight regain, lack of follow-up past the first year, and pre-operative "warning" about the potential for transfer addiction (i.e. substituting of a substance for food post-surgery such as alcohol/drug misuse.) (Bagdade & Grothe, 2012; Yanos et al., 2014).

Bariatric support group attendance post-surgery is a valuable component of continuing follow-up care. With this in mind, another important finding is the lack of long-term support groups, and that many surgical sponsored support groups are geared towards "newbies" (new post-operative bariatric patients) and don not address the issues that long-term "vets" require for continued weight loss success (McMahon et al., 2006). Other general barriers to engaging in formal support, which corroborate with what Geraci and colleagues (2014) found included far away locations, difficult meeting times, employment commitments, general dislike of the group dynamic, or the support group disbanded.

Discussion

One of the purposes of the present study was to gain an understanding of psychosocial variables and the influence they have on long-term bariatric patients and weight regain. This study used a combination of quantitative and qualitative data to provide a deeper understanding of patients' bariatric experiences.

The results of the stepwise multiple regression revealed insight into the unique relationships weight regain has with height, amount of time since surgery, maximum post-operative weight loss, adherence to post-operative diet, self-concept/appearance, and self-concept/well-being. While holding all other predictor variables constant, the average amount of weight regain can be expected to decrease by approximately four pounds for each increase of one point on adherence to post-operative diet item. In more general terms, this implies that lower amounts of regain are associated with stricter observance of the recommended diet. In accordance with the sparse long-term literature, there is a significant positive relationship between the amount of time since surgery and regain. For each month after surgery, the expected amount of regain increases by about one-tenth of a pound (or, equivalently, patients will on average gain back 1.2 pounds each year post surgery).

The maximum amount of weight loss (patient's highest weight – lowest weight) was also found to be a significant predictor of weight regain. Those who have larger differences from their lowest to highest weights can generally expect to regain slightly more weight. It is not surprising that height was found to be a significant predictor since it was essentially a control variable. It is logical to assume that taller people will tend to regain more weight proportionally.

Although it has been well established that bariatric surgery is essentially safe and effective for weight loss, many factors affect the outcomes of bariatric surgery and its long-term success. Regardless of surgery type, long-term bariatric success requires significant behavioral changes and is largely dependent on an individual's ability to implement permanent lifestyle changes, such as adhering to a strict nutritional and exercise regimen, and acquiring new coping skills to decrease reliance on food for addressing emotional needs (Bauchowitz, et al., 2005; Karmali et al, 2013). Past research reports that 80% of patients who have limited post-surgery

weight loss, never had any psychological follow-up to deal with issues such as disordered eating (Magro et al., 2008).

Pre-surgery bariatric patients may have years of unhealthy physiological and psychological eating patterns ingrained that may include rapid eating, binge eating, and emotional eating. Initially, the surgery may help reduce these maladaptive eating patterns by the sheer physical and anatomical mechanism of the surgery. However, one must consider the often life-long eating patterns that must be altered in conjunction with altered physiological components. Without addressing possible psychological issues, the patient may override the biological mechanism and regain weight. Weight recidivism is a concern because patients' health issues that were previously resolved with the surgery and immediate weight loss may return (Shah et al., 2006).

Moreover, although all surgeons generally encourage support groups, less than a third of participants (32%; $n = 216$) in the present study reported to belonging to some type (either formal or informal) of support group. There is no standard set of recommendations to which all bariatric clinics must follow, only proposed suggestions by the American Society for Metabolic and Bariatric Surgery (ASMBS, 2015, "Benefits of bariatric surgery"). Many formal bariatric support groups cater to newer post-ops (usually the first year post-surgery) and because the experiences of newer post-operative patients generally differ from long-term patients, "veteran" patients may feel isolated by discussion topics at their surgical support group (Geraci et al., 2014).

Weight recidivism is a complex issue with many mechanisms at work including both patient-related and surgery-related factors (Karmali et al., 2013). Generally, bariatric patients lose 100 pounds or more during the active weight loss period during the first 12-18 months post-

surgery. Even a small amount of weight regain can have a devastating impact on a patient's self-concept and ignite a depressive episode, which overshadows the ability to view the significant weight loss they achieved post-surgery. In addition, the patient vastly fears the regain is a sign that they will relapse back into morbid obesity. This fear can cause many patients into become paralyzed—unable to get "back on track" to follow their respective surgeon's post-operative recommendations. This is why post-operative follow-up care for patients presenting with weight regain is so imperative and should include evaluating a multitude of factors including dietary intake, psychological issues, and physical activity levels (Karmali et al., 2013). The process for patients to maintain long-term weight loss following bariatric surgery can be difficult and it is important to gain an understanding of the relationship and impact of psychosocial outcomes on this life-changing procedure.

The present study contains a number of strengths including adequate sample size from unique sources, promising opportunities and support in assisting future patients, families of patients, and healthcare providers in gaining an understanding of the needs of long-term bariatric patients, and the use of mixed methods to gain a richer knowledge of the qualitative aspect of the research. Although the results of this study may give more insight in treating long-term patients and weight recidivism, the limitations of this study must be taken into account, as described below.

Limitations

This study represents the first published attempt at empirical investigation using the survey instrument. Although, a pilot test was conducted prior to the start of the current study, further testing of the instrument is needed to assess accuracy and validity, as with other objective bariatric measures. Additional limitations include self-reported long-term outcomes and lack of

baseline data to compare pre- and post-bariatric outcomes, which may further limit accuracy of responses. Finally, the generalizability of the results may be impacted, as the majority of respondents (n = 534) were from one U.S. Midwestern bariatric center, with little ethnical diversity, which may not have been representative of the true essence of long-term bariatric outcomes.

Future Directions

Every piece of literature regarding long-term bariatric outcomes reviewed for this article state there is a crucial need for continuing education and surgical follow-up to ensure continued weight loss success and maintenance during the move from the weight stabilization to inactive weight loss post-operative periods (18-24 months post-op). The inactive period is where patients may face the threat of crossing the threshold from weight maintenance into weight regain. The causes of weight recidivism can be overlapping and varied due to medical, anatomical, behavioral, psychological, or a combination of problems. A major key in preventing weight regain is continuing post-operative education and follow-up. Both before and after weight-loss surgery, patients need to be taught how to use their surgery to optimize their success involving the importance of dietary adherence, behavioral and psychological health, and physical activity. Many of the known negative psychosocial impacts of weight recidivism could potentially be mitigated by continuing education and follow-up regarding potential long-term issues that can have damaging consequences and ultimately place the patient back at the starting line.

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CHAPTER VI. PERCEPTIONS OF SELF AND SOCIETY: A PHENOMENOGRAPHIC ANALYSIS OF LONG-TERM BARIATRIC PATIENTS

Abstract

Bariatric surgery is increasingly a popular solution to reversing the effects of obesity. Psychosocial factors associated with the long-term effectiveness of bariatric surgery (i.e., self-concept and obesity discrimination) are emerging as relevant research issues. This study investigated bariatric patients' long-term experiences and the different effects to 'self.' A qualitative phenomenographic approach was utilized through analysis and interpretation of participants' written responses. Participants were on average 70.9 months post-operative, and responded to an open-ended question about bariatric experiences (n = 533). Three different experiences emerged from the data**:** self-realization, self-reflection, and self in relation to society. Findings revealed different aspects of 'self' (i.e., body image, stigmas of eating, weight regain, and obesity), had an affect on participants multiple years post-surgery. Through the 'self-reflection' of post-operative experiences, participants were motivated to share their experiences, knowledge, and advice to benefit others through research.

Introduction

Obesity is a serious and significant public health epidemic affecting more than 78 million Americans (Flegal, Carroll, Kit, & Ogden, 2012). It is known that obesity increases risk factors for a multitude of co-morbidities including cardiovascular risk factors, such as hypertension, type 2 diabetes, as well as other chronic health conditions (Zamosky, 2013). The effect of obesity in the adult population in regards to life expectancy and premature death is remarkable. A recently published study found that being obese at a young age was more damaging to health and life expectancy and on average 20-39 year-olds who are obese face 6.1-8.4 years of life lost (Grover

et al., 2014). Moreover, healthy life-years lost were two to four times higher than total years of life lost for all age groups that participated in the study (Grover et al., 2014).

Unfortunately, the use of lifestyle changes alone to treat the disease of obesity (dietary and exercise regimens, behavioral modification) have been generally unsuccessful in achieving long-term results (Dorman et al., 2012; Neff et al., 2013; Throsby, 2009; Zamosky, 2013). Therefore, bariatric surgery, the 'technology of last resort' (Throsby, 2009, p. 203) has become an increasingly utilized alternative because it presents a possible long-term solution.

Health-related quality of life (HRQoL) does not only factor in a patient's health conditions, but also takes into account a patient's emotional reactions to health problems (Legenbauer, Herpertz, & De Zwaan, 2012). Karlsson and colleagues (2007) found that patients reported HRQoL improvements even 10 years post-surgery and that most of the improvements were tied to the amount of weight loss and weight regain had a decrease on HRQoL. Once the active period of weight loss ceases post-operatively (usually 18-24 months), quality of life issues can have a significant effect when patients have to acknowledge that their "armor of fat" may have been used as a shield from higher order self-realization and the resolution of obesity-related conditions alone does not resolve all problems (Bocchieri, Meana, & Fisher, 2002; Meana & Ricciardi, 2008, p. 170). A recent study among patients six years after Roux-en-Y gastric bypass (RYGB) found that losing the excess weight does not necessarily contribute to a definite improvement in quality of life regarding physical and social facets, but that one's weight affects quality of life both positively and negatively (Heidmann & Grønkjær, 2015). For example, patients are able to live more active lives, but may face mental issues caused by fatigue and excess, redundant skin (Heidmann & Grønkjær, 2015). Improvements in quality of life issues have been reported to plateau one to two years post-surgery and may actually settle at levels seen

in non-obese populations (Heinberg & Lavery, 2014).

In regards psychosocial surgical outcomes, such as self-concept (self-esteem, self-confidence, and body image), past research found significant post-operative emotional and quality of life improvements in the first two years post-surgery (Herpertz et al., 2003; Hsu et al., 1998; Mamplekou, Komesidou, Bissias, Papastantinou, & Melissas, 2005; Puzziferri, 2005). Yet, there are conflicting results regarding the impact of psychosocial outcomes. Although current published research conveys that most patients experience some degree of psychosocial improvement, there is still considerable variability in surgical outcomes such as a lack of weight loss, weight regain, and excess, redundant skin (Bocchieri et al., 2002; Karmali et al., 2013; Kubik, Gill, Laffin, & Karmali, 2013; Ramalho et al., 2014; Throsby, 2008; Yanos, Saules, Schuh, & Sogg, 2014). It is postulated that positive changes in self-concept post-surgery are thought to be directly related to significant improvements in body image and satisfaction direct relationship to the active weight loss period (Bocchieri et al., 2002; Legenbauer et al., 2012).

Meana and Ricciardi (2008) note that American society is so "unforgiving of obesity," and that disdain and discrimination are thinly veiled in public domains. Weight gain is widely believed by society to be a controllable factor and is often considered a sign of character weakness (i.e. laziness, sloppiness, lack of self-discipline) (Meana & Ricciardi, 2008; Puhl & Heuer, 2009). The stigmatization of obesity is prevalent in a number of areas in an individual's environment including social settings, school, workplace, and interactions with health care professionals (Puhl & Heuer, 2009). Long-term bariatric patients may face discrimination indefinitely. Recent research suggests that attitudes towards the formerly obese can perpetuate obesity stigma after learning about the method of weight loss (Vartanian & Fardouly, 2013). Vartanian and Fardouly (2013) found that participants evaluated images more negatively of

individuals who lost weight through bariatric surgery than those who engaged in traditional diet and exercise because those who lost weight through surgery were not viewed as being responsible for their weight loss. Living in a society, which degrades those who are obese leaves a lasting impression of shame, even if it is in the past. Meana and Ricciardi (2008) powerfully note that obesity is experienced as an "essential quality that transcends weight and cannot be completely eliminated no matter how much weight is lost" (p. 155).

Psychosocial factors associated with the long-term effectiveness of bariatric surgery such as self-concept and obesity discrimination are emerging as relevant issues in bariatric research. There is a paucity of research, which examines the psychosocial differences of long-term bariatric patients. One of the aims of this study was to explore the variations among long-term bariatric patients' journeys in order to gain an understanding of the shifting experiences and perceptions of long-term bariatric patients regarding the embodiment of 'self'.

Methods

This paper used a phenomenographic research design, which was developed in the 1970s by a group of Swedish researchers and has historically been applied in an educational context traditionally involving small groups of participants and the use of open-ended questions in an exploratory fashion to delve into the qualitatively different ways in which a phenomenon is experienced (Marton, 1981; Sjöström & Dahlgren, 2002). However, in the last two decades, phenomenography has also been used to assess a broad range of experiences by a group involving analyzing written responses from participants on questionnaires or drawings to evaluate a learning or understanding context (Bradbeer, Healy, & Kneale, 2004; Edwards, 2007; Prosser, 1994; Unal & Zollman, 1999). Marton as describes Phenomenography:

> …a research method adapted for mapping the qualitatively different ways in which people experience, conceptualize, perceive, and understand various aspects of, and various phenomena in, the world around them. … phenomenography investigates the qualitatively different ways in which people experience or think about various phenomena. (Marton, 1986, p.31)

Marton and colleagues found this design possible because they did not look at the individual as the central source of data, but rather focused on the collective as supplying narrative fragments regarding how the phenomenon was experienced (Trigwell, 2006). Phenomenographic research focuses on exploring how participants form internal relationships between themselves and the world; a person "cannot experience without something being experienced" (as cited in Yates, Partridge, & Bruce, 2012; p. 98).

Phenomenography recognizes two research approaches; a first-order perspective focuses on how the world actually is, while a second-order perspective is concerned with how the world is experienced (Yates et al., 2012). The key feature of phenomenography is that the researcher(s) take a second-order perspective in describing participants' ways of experiencing, understanding, and seeing the world around them (Yates et al., 2012). This second-order perspective is analyzed through statements about the participants' experiences of the world, where the researcher(s) must endeavor to see the phenomenon through the eyes of those experiencing it (Sjöström & Dahlgren, 2002; Yates et al., 2012). Knowledge in phenomenographic research is acquired through various meanings in regards to the phenomenon being explored, and the various ways participants experience it (Yates et al., 2012). Additionally, phenomenography takes these different experiences and understandings and places them into descriptive categories of

differences into the collective of individual statements about experiences of an a facet of reality (Ashworth & Lucas, 2000).

Although, phenomenography has mainly been studied in an educational context, Sjöström & Dahlgren (2002) applied the design in nursing research as a useful method to understand how patients experience their disease, including signs and symptoms, and treatment of their condition. Recent studies have employed phenomenography to describe and develop treatment protocols in regard to adolescents with obesity (Morinder, Biguet, Mattson, Marcus, & Larsson, 2011), as well as how primary health care professionals perceive patients with obesity (Hansson, Rasmussen & Ahlstrom, 2011). After an in-depth review of the bariatric literature, the researchers could only find one phenomenographic article related to bariatric surgery, which described how adults in the pre-operative stage of bariatric surgery, experienced physical activity (Wiklund, Olsén, & Willén, 2011).

Participants

Upon approval from the university's Institutional Review Board, participants were recruited either from public bariatric support forums (n =119) or through a regional weight management center in the Midwest (n = 414), which specializes in bariatric surgery. Participant criteria for inclusion included those who were at least 18-months post-operative and over the age of 18. Participants were recruited through both outlets regardless of gender, age, surgery type, ethnicity, or socioeconomic status. The final qualitative sample included 533 participants (87.8% female) who ranged from 22-84 years of age (M=52.8). The majority of participants had the Roux-en-Y Gastric Bypass (RYGB) (79.5%). The researchers were only permitted to collect self-identified ethnicities from public support forums (85% White, non-Hispanic), but the Midwestern weight management center comprises of a roughly 90% White, non-Hispanic

population. Further demographic characteristics and self-reported anthropometrics are presented in Table 6.1 and Table 6.2.

Table 6.1. *Demographic Characteristics of Respondents*

Characteristic	*n*	%	Valid %
Age Groups			
Young (22 to 39)	94	17.6	17.6
Early Midlife (40 to 49)	120	22.5	22.5
Late Midlife (50 to 59)	141	26.4	26.5
Older (60 to 69)	120	22.5	22.5
Oldest (70+)	58	10.9	10.9
Total Responses	533	99.8	100.0
Surgery Type			
Bypass	423	79.2	79.5
Sleeve	89	16.7	16.7
Band	17	3.2	3.2
DS	3	.6	.6
Total Responses	532	99.6	100.0
Gender			
Female	469	87.8	87.9
Male	64	12.2	12.2
Total	533	100.0	100.0
Level of Education			
Less than high school	7	1.3	1.3
High school/GED	115	21.5	21.6
Some college	238	44.6	44.7
College degree (or above)	173	32.4	32.5
Total Responses	533	99.8	100.0
Relationship Status			
Single	59	11.0	11.1
Married/Domestic Partnership	357	66.9	67.0
Divorced/Separated	88	16.5	16.5
Widowed	29	5.4	5.4
Total Responses	533	99.8	100.0

Note. Some characteristics may not add to total sample size due to non-response by some participants.

Table 6.2. *Self-reported Participant Anthropometrics (Pre-surgery and Current)*

Characteristic	*n*	*M*	*SD*
Age (years)	533	52.83	12.82
Time since surgery (months)	531	70.98	44.33
Weight on the day of surgery (lbs.)	533	281.48	54.98
BMI[a] on the day of surgery	533	46.23	7.65
Lowest weight achieved (lbs.)	532	162.77	39.54
Lowest BMI[a] achieved	532	26.69	5.70
Current weight (lbs.)	533	183.42	45.86
Current BMI[a]	533	30.08	6.56
Current post-surgery weight loss[b] (lbs.)	533	108.95	43.90
Max. post-surgery weight loss[c] (lbs.)	532	129.68	42.77
Current post-surgery regain[d] (lbs.)	532	20.57	21.99

[a] Body Mass Index (BMI) formula: weight (lbs.) / [height (inches)]^2 × 703
[b] Current weight loss formula: highest weight (lbs.) – current weight (lbs.)
[c] Max. weight loss formula: highest weight (lbs.) – lowest weight (lbs.)
[d] Regain formula: current weight (lbs.) – lowest weight (lbs.)

Procedures

The researchers utilized five online public bariatric forums, which each contain hundreds to thousands of members in various stages of the bariatric surgery process (pre-operative, peri-operative, and post-operative). Although the researchers may have posted recruitment notices with the web-based questionnaire link to online forums, personal contact with participants did not occur and it is unknown how many members actually viewed the recruitment notice. The notice was posted approximately once a week for 12 weeks. Data were collected using a web-based survey system (Qualtrics).

The Midwestern weight management center personnel used their patient database to identify potential participants meeting inclusion criteria and paper questionnaires were mailed with the option to complete the questionnaire online. The questionnaires were returned to the researchers containing no identifying information. Data collection concluded approximately 12

weeks after the paper questionnaires were mailed. These data were subsequently entered into a database and merged with the data collected online.

A bariatric questionnaire was constructed in two major steps, with a modification in-between, regarding long-term bariatric outcomes consisting of 12 demographic items (i.e. age, height, weight outcomes, surgery type, and relationship status) and 26 five-point Likert-scale items. Prior to the start of study, the post-surgery questionnaire was reviewed by educational and health professionals for content and readability and revised as directed. The revised questionnaire was pilot tested with a sample of 12 bariatric patients for content.

For the purposes of the current phenomenographic analysis, reporting of the demographic data (Table 6.1 and Table 6.2) were limited only to participants who provided narrative responses. The focus of the categories of description were drawn from one open-ended item at the end of the questionnaire: "What else would you like to tell us about your bariatric surgery experience?"

Qualitative data analysis and coding. There is no single technique prescribed in the analysis of phenomenographic data and many approaches have been taken in past research (Yates et al., 2012). Therefore, the researchers carried out the analysis according to the 7 consecutive steps proposed by Dahlgren and Fallsberg (1991) and utilized in past research regarding health care and nursing (Sjöström & Dahlgren, 2002) and understanding physical activity in pre-operative bariatric patients (Wiklund et al., 2011):

1. *Familiarization:* the responses were read through multiple times to gain an overall impression and for clarity.
2. *Condensation*: Any statements made by participants about self/society were extracted in order to provide a concentrated and representative version of the dialogue.

3. *Comparison*: the obtained quotes were studied with each other in order to find sources of variation or agreement.
4. *Grouping:* similar quotes were grouped for initial categorization.
5. *Articulating:* Several attempts were made and revised to combine the group similarities into categories of description to extract the essence of the quotes within each group.
6. *Labeling:* the categories were named to reflect their essence.
7. *Contrasting:* in order to gain unique view of each category, the categories of description were compared with each other for similarities and differences and ultimately labeled in this final step.

Participant responses were combined into a master document and organized systematically according to emerging broad categories. In addition to the 7 steps of analysis, categories of description were based on three principles described by Marton (1986). These include—1) categories should emerge from participant responses; 2) categories are not distinguished as "all or nothing", but instead distinguishable; and 3) responses needed to be explicit to be categorized. The first author employed an iterative process in the analysis of coding categories. Comparing and analyzing patterns assisted with understanding how coding categories were alike and how they were different. After transcription, each response was printed for clarity and the process of grouping responses for emerging categories were manually generated in order to ensure vital information was complete and considered in this study. The process of articulating allowed the researchers to provide direct and indirect information to support potential patterns and participants' experiences. In addition, post-it notes of various colors aided in identifying categories of description. The first transcript reading of responses assisted in developing initial categories, and then the second reading was conducted to formally start the process of

comparison systematically using colored post-it notes to group related data (Hays & Singh, 2011). The subsequent transcript readings of responses aided in identifying new categories of description while using the contrasting process and finally the lists of categories were merged into one list, which constituted the final categories of description presented in an outcome space (Marton, 1986).

Qualitative data quality concerns. The researchers established trustworthiness through credibility, peer debriefing, and reflexive researchers statement. Establishing trustworthiness of the findings was utilized by engaging in peer debriefing of responses and through prolonged discussions during all phases of the study with peers and fellow researchers. Researcher reflexivity was engaged in by keeping a notebook, which included the researchers' thoughts on participant responses. Credibility may also be a concern during qualitative data collection. Data quality, meaningfulness, and interpretation were established through breadth and authenticity of the collected data. Credibility was improved through using recollections of the researchers own experiences with bariatric surgery (reflexive journaling, reflexive researchers' statement) and previous research and engagement with other bariatric patients.

Reflexive Researchers' Statement

The researchers' personal experience as bariatric patients included pre-conceived beliefs that bariatric surgery should be for obese individuals who had failed attempts at losing weight through traditional methods with diet and exercise and who need an additional weight-loss tool to aid in achieving a healthy body weight. Being part of the bariatric surgery community comes with a very "pro-surgery" mentality that the researchers acknowledged. To focus on the participants' responses regarding their bariatric surgery, the researchers were required to bracket those beliefs through written statements, in an attempt to identify potential biases and

assumptions about obesity and bariatric surgery (Hays and Singh, 2011). According to Cope (2004), phenomenographic analysis requires the researcher(s) to acknowledge their backgrounds and to approach the data with an open mind, as a researcher's prior experiences are part of the process. Moreover, the explorative nature of data collection and interpretive process of data analysis involves the researcher having some relationship with the data, and a researcher's unique background is an essential part of this process (Cope, 2004).

Findings

Of the participants that returned the questionnaire, 533 provided a narrative response to the following question: "What else would you like to tell us about your bariatric surgery experience?" The breadth and length of narrative responses participants provided varied exponentially from a couple of sentences to multiple handwritten pages attached to the original questionnaire, which ultimately resulted in 158 pages of narrative output.

In phenomenographic analysis, categories of description are usually described in terms of meaning and structural conceptions (Cope, 2004). Seven different conceptions emerged from the written responses. Three different descriptive categories emerged from the data analysis illustrating long-term bariatric patients experiences with the embodiment of 'self': self-realization, self-reflection, and the self in relation to society. Table 6.3 presents the descriptive categories and the seven different conceptions in relation to each category of difference. Each of the following conceptions are illustrated with quotations from individual responses.

Table 6.3. *Bariatric Patients' Conceptions and Experiences with Embodiment of 'Self'*

Descriptive Category	Conceptions	Number of Statements
Self-realization	The person in the mirror	52
	Food problems don't just go away	63
	The shame of weight regain	129
Self-reflection	Bariatric surgery is just a "tool"	49
	The desire for a "re-do" of bariatric surgery	31
Self in relation to society	The acknowledgment of existence	33
	Kindness and attention from strangers	48

Self-realization

The person in the mirror. Adapting to weight loss psychologically can be a very daunting task. Although, massive amounts of weight were lost, many respondents still felt as though they did not recognize their new outward bodies because they still perceived their bodies as obese and still had the mindset of when they were obese (Meana & Ricciardi, 2008; Warholm, Øien, & Råheim, 2014). Moreover, another variation of this category is the experience of excess, sagging skin from substantial weight loss, which can have a significant effect on an individual's self-concept regarding body image dissatisfaction and embarrassment (Bocchieri et al., 2002; Kubik, Gill, Laffin, & Karmali, 2013; Ramalho et al., 2014; Steffen, Mitchell, & Karr, 2012).

> 'Most of the time I still think of myself as obese—then I'll catch a look at myself in the mirror and think, 'Wow! Is that me?!'
>
> 'I have the problem of self-image distortion. I can not see the skinny, me only the fat one I was.'

'I HATE the extra skin I'm now left with—it's depressing and shameful.'

'I have never had reconstructive surgery and it upsets me to have the loose, flabby skin hanging on my belly and my arms.'

Food problems don't just go away. The conception of responses that long-term bariatric patients were affected in various ways by the self-realization that just because one had surgery does not mean that adhering to the recommended post-operative dietary guidelines as the years passed since surgery becomes any easier once the "honeymoon" period 12-18 months post-surgery ceases (Frank, 2014; McMahon et al., 2006; Meana & Ricciardi, 2008). Tendencies towards using food as comfort and emotional eating were still a struggle, even more so as time passes since surgery (Geraci, Brunt, & Marihart, 2014). Factors causing food problems were varied, from the return of the hunger they knew as a person affected by morbid obesity, to the fickleness of struggles with the inconsistences of certain foods being tolerated, to still feeling a "lack of control" over their eating habits. Finally, to a lesser extent, but warrants noting, a group of participants explicitly noted the replacement of food with alcohol ($n = 21$), a phenomenon known as "transfer addiction" (Heinberg & Lavery, 2014).

'I fear I will eventually regain most of what I lost. Hunger has returned with a vengeance…I feel I have failed the process by my own inability to adhere to a reasonable program of diet/exercise.'

'The first year and a half was really tough…could eat very little, mostly soup…now I can eat a variety of food but every couple of weeks nothing will go down easy (like chicken or turkey).'

‘After one year [post-surgery], I started snacking on extra goodies, never once got sick. It’s gotten to be a steady downhill road since…why I fell off the [dietary] plan…and how to get control of myself and my eating is completely out of control.’

To a lesser extent, the issues of coping with food to transferring coping to other substances, such as alcohol is an emerging problem in the bariatric community, which has not received extensive attention in bariatric research (Steffen, Roerig, & Engel, 2012).

‘Alcohol has become a problem. I never had a problem with alcohol before surgery…about 2 years past surgery, I began drinking alcohol. It has a different effect on me and I can’t explain why I crave it? I have also noticed this problem with other friends that have had bypass [RYGB].’

‘I developed a serious addiction to alcohol. It replaced food addiction. In the beginning stages post-op you are trained to consume large amounts of fluids…later the fluids were alcoholic beverages.’

The shame of weight regain. Weight regain is after bariatric surgery is a complex issue with many mechanisms at work including both patient-related and surgery-related factors (Karmali et al., 2013). Generally, bariatric patients lose 100 pounds or more during the active weight loss period during the first 12-18 months post-surgery. Even a small amount of weight regain can have a devastating impact on a patient’s self-concept and ignite a depressive episode, which overshadows the ability to view the substantial weight loss they achieved post-surgery. In addition, the patient vastly fears the regain is a sign that they will relapse back into morbid obesity.

‘We tend to lose it all if we don’t maintain constant support, I have lost that and don’t know how to get it back. I am gaining weight and I hate myself for it.’

'I have gained some weight and have tried so hard to get it off…it feels like I let myself down.'

Self-reflection

Bariatric surgery is just a "tool." Consistent with the findings of Geraci and colleagues (2014) many participants made statements about coming to the realization that bariatric surgery is just a "tool" to aid in weight loss and offered words of advice to others about their knowledge regarding their bariatric experiences.

'The surgery is an amazing tool, but when I stopped using it diligently, I lost a lot of the benefits!'

'It's not a cure-all, but a tool, a lifestyle change and must continually work on changing…'

The desire for a "re-do" of bariatric surgery. One intriguing finding that emerged during the classification of the self-reflection category, was that a significant amount of respondents made statements about expressing the desire to have bariatric surgery again, and knowing what they would do differently the after the second surgery to be successful.

'I wish I would have fixed my stress levels before I had surgery. My stress was so high that I kept eating and ended up heavy again. I wish I could do it [the surgery] again, but I have no health insurance.'

'I would very likely have the surgery again, but I would do my aftercare better. I think at the time of my surgery, I just did not take it seriously about what to do after the surgery to lose as much weight as I should have and what I needed to do to keep it off.'

Self in Relation to Society

The acknowledgment of existence. The perception of invisibility when one is morbidly obese and stigmatized by society appears to be a somewhat common finding in past qualitative research (Bocchieri et al., 2002; Meana & Ricciardi, 2008; Warholm et al., 2014). Meana and Ricciardi (2008) posit that "the sense of invisibility emanates from the experience of being ignored or dismissed…when you are extremely obese, being in public can be paradoxically, a very isolating existence" (p. 54).

> 'It is amazing and sad how people actually hold doors open for you and smile [and] acknowledge you. Being obese, it was like I was invisible.'
>
> 'Before, I was totally invisible and treated like a leper. Now, I am seen more…I am not made fun of as much.'

Kindness and attention from strangers. Many participants made statements regarding how "nice" people were now when they had not been before surgery. The variations of "niceness" experienced by respondents occurred in a multitude of ways such as department stores, restaurants, polite gestures, and attention from the opposite sex.

> 'People don't look at me with pity or disgust anymore. They're nicer to me…doors are held open for me. People are more courteous.'
>
> 'Strangers are nicer to me. Men flirt with me. People take me seriously who did not before. I did not expect these things as I felt I was confident and outgoing before surgery."
>
> 'I feel that I get treated much better in public since I am considered a more acceptable size/weight by society. I notice people are much friendlier, men hold doors open for me, I receive a lot more smiles and acknowledgment.'

Discussion

A phenomenographic approach was used in this study to understand the various experiences of long-term bariatric patients with the embodiment of 'self.' Although a convenience sample was utilized, the researchers did not employ purposive sampling. It can be noted that due to varying written statements by a very large sample of participants, the possibility of exploring different conceptions increases the chances of exploring important factors that many long-term post-surgery patients experience. Two of the researchers were familiar with the struggles and experiences of the lived experience after bariatric surgery, but also morbid obesity (AAG and CLM). The first author worked extensively with the second author on data analysis and peer debriefing in understanding the need to approach the data in a non-judgmental way.

The researchers attempted to present the findings of the study as fully as possible and through the attempt of using suitable statements from participants to illuminate transferability; which allows the findings to be conveyed to other groups (Hays & Singh, 2011). The researchers have left the reader to elucidate upon the transferability of the findings of this study, but this study concurs with Wiklund and colleagues (2011) and Sjöström and Dahlgren (2002) in using a phenomenographic approach as an attempt to understand how patients experience the facets of their disease (i.e., obesity), the symptoms, treatment (i.e., bariatric surgery), and their current circumstances. The findings can then be understood and utilized by educating bariatric professionals of the shifting needs of long-term patients, pre-operative patients, long-term patients, and the potential for utilizing a multidisciplinary team approach (Abela, Stevens, Reddy, & Soldin, 2011).

Bariatric surgery continues to increase as a surgical intervention to treating the disease of obesity. Due to the failure of lifestyle and behavioral modification programs in achieving long-term weight loss and heightened national attention, an estimated 179,000 bariatric surgeries performed in the United States in 2013 (ASMBS, 2015). Although, there is a plethora of research on the improvement of co-morbid conditions, the psychosocial aspect of bariatric surgery in regards to long-term patients is still emerging. Based on the written statements gained from participants in the current study, seven conceptions across three different descriptive categories emerged from the data illustrating long-term bariatric patients experiences in regard to the notion of self and society: self-realization, self-reflection, and the self in relation to society.

The embodiment of 'self' clearly demonstrated the varied experiences of long-term bariatric patients. For example, many respondents noted body image dissatisfaction, which can impact psychological distress (Sarwer, Bishop-Gilyard, & Carvajal, 2014; Ortega et al., 2012). Excessive, loose skin from massive weight loss can impact many facets quality of life including physical, social and, psychological domains, which may impact long-term weight outcomes (Heidmann & Grønkjær, 2015; Ramalho et al., 2014). In general, removal of excess skin is considered a cosmetic procedure in the majority of cases and health insurance will typically not cover the costs of procedures.

Self-esteem has also been associated with adherence to post-operative dietary guidelines, which many individuals still reported coping with food or alcohol. (Heinberg & Lavery, 2014; Wimmelmann, Dela, & Mortensen, 2014). Moreover, many respondents noted that weight regain after surgery carries a certain shame, which might have an effect on bariatric follow-up and support (Karmali et al., 2013). It is well documented that those that suffer from obesity face discrimination in society (Meana & Ricciardi, 2008; Puhl & Heuer, 2009). The respondents in

this study noted that society treated them much more positively after surgery. The simple act of making eye contact, acknowledgement, or a simple smile allowed many respondents to simply *exist* in the world again.

Limitations

The findings of this study regarding long-term post-surgery outcomes may not be representative of all bariatric experiences. Additionally, the researchers acknowledge that due to the limitations of the data collection (restrictions of time, questionnaire items, and participant confidentiality), it was not feasible to achieve in-depth interviews with participants, and as such had to collect written responses instead. The researchers concede that although there may have been a lack of depth in the collected narratives, the extensiveness in the sheer quantity of responses may assist in mitigating the depth of descriptive essence. The open-ended question posed was very general, and the variety of responses was diverse across many different post-operative outcomes, therefore, the categories of description for this study emerged out of plethora of various other topics that respondents noted. The number of statements related to each conception is noted in Table 6.3.

Conclusion

A phenomenographic approach to data collection was utilized for this study in order to gain a better understanding of outcomes in long-term bariatric patients. Phenomenography is rooted in mainly an educational and learning context (Marton, 1981). The researchers posit that bariatric surgery, emergence from the disease of obesity, and the knowledge of one's 'self' is a continuous learning experience wrought with both positive and negative attributes. Aside from one phenomenographic study reviewed, which explored the experiences of pre-operative

bariatric patients and their views on physical activity (Wiklund et al., 2011), this is the first known phenomenographic analysis utilizing long-term bariatric patients.

Abela and colleagues (2011) recommend that a critical key to success for long-term bariatric patients is having access and care of multidisciplinary teams including a bariatric surgeon, gastro-intestinal specialist, endocrinologist, nutritionist, and psychiatrist at the minimum. Moreover, there is a need for plastic surgeons to be included on the team are noted as reconstructive surgery may have a positive impact on self-concept and other psychosocial outcomes (Abela et al., 2011). Bariatric surgery is a life-changing procedure that requires a commitment for life from the patient. Using a phenomenographic approach to explore the variations of the embodiment of 'self' in long-term patients provides an opportunity for future patients, families of patients, and health care providers to gain knowledge and to understand what it is like to live with the persistent, shifting change of bariatric surgery.

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CHAPTER VII. SUMMARY AND CONCLUSIONS

Summary

One of the aims of this study was to gain an understanding of psychosocial variables and the influence they have on long-term bariatric patients and weight regain and by utilizing a mixed methods approach, a potentially deeper understanding of patients' bariatric experiences with post-procedure weight gain was acquired. A multiple linear regression analysis was conducted with reported anthropometrics in order to build the most efficient model for the purposes of predicting weight regain in long-term patients.

The results of this model implies that lower amounts of regain are associated with stricter observance of the recommended post-operative diet, which is in accordance with past research noting the various psychosocial factors to weight regain such as disinhibition of eating, grazing behavior (continuous snacking throughout the day), food cravings, and not following aftercare recommendations (including diet) (Bocchieri et al., 2002; Bond et al., 2009; Buchenwald et al., 2004; Yanos et al., 2014).

Additionally, in accordance with the sparse long-term literature (Bocchieri et al., 2002; Mamplekou et al., 2005; Yanos et al., 2014), there is a significant positive relationship between the amount of time, which has passed since an individual's surgery and regain. For each month after surgery, the expected amount of regain increases by about one-tenth of a pound (or, equivalently, patients will on average gain back 1.2 pounds each year post surgery).

The maximum amount of weight loss (patient's highest weight – lowest weight) was also found to be a significant predictor of weight regain. Those who have larger differences from their lowest to highest weights can generally expect to regain slightly more weight. This also is not necessarily a new finding as Puzziferri (2005) reviewed a multitude of literature regarding

psychosocial factors and weight regain and discovered that psychological problems (depression, anxiety, suicidal ideation) and eating and behavioral factors (binge eating, high calorie food consumption, sweets, lack of exercise, grazing/snacking throughout the day) predicted post-operative weight regain, no matter how much weight was lost post-procedure. The behavioral aspect of weight recidivism cannot be devalued, although Puzziferri (2005) also acknowledges the significant role of biological factors such as a higher body mass index pre-operatively and/or older age in contributing to long-term weight regain.

The qualitative responses from participants aided in giving a more in-depth understanding of the post-surgery weight regain phenomena. Participants most frequently reported the negative emotions that were associated with personal weight regain. Specifically, participants perceived negative emotions surrounding their post-operative weight regain experiences. Emphasis appeared to be placed on descriptors related to self-esteem, self-confidence, and lack of assertion, which are believed to be important variables related to one's mood and self-efficacy (Bocchieri et al., 2002). Additionally, many participants noted the lack of willpower they had in regards to food, that they still struggle with food relationships, and/or that they "fell off track" in adhering to the post-surgical diet. Many participants associated food as a means to cope and the challenge of finding new ways to channel emotions without turning to food (Bocchieri et al., 2002; Ogden et al., 2011).

Another central theme that may have an adverse contribution to weight regain and self-efficacy following bariatric surgery is the importance of long-term bariatric follow-up and support. One of the major subthemes that may serve the bariatric surgical community is the notion that many participants reported feeling that there was "a lack of education" by their surgical team regarding preparation for potential long-term issues including vitamin and mineral

deficiencies, weight regain, lack of follow-up past the first year, and pre-operative "warning" about the potential for transfer addiction (i.e. substituting of a substance for food post-surgery such as alcohol/drug misuse.) (Bagdade & Grothe, 2012; Yanos et al., 2014).

A related topic to psychosocial issues and weight regain explored during this study used a qualitative phenomenographic approach was to explore participants' responses in order to gain an understanding of the shifting experiences and perceptions regarding the embodiment of 'self.' It is postulated that positive changes in self-concept post-surgery are thought to be directly related to significant improvements in body image and satisfaction directly related to the active weight loss period (Bocchieri et al., 2002; Legenbauer et al., 2012). All of the participants for this study, were not in the active weight loss period, which is estimated to end approximately 18-months post-procedure, which may have colored their responses in a negative light. Based on the written responses gained from participants in the current study, seven conceptions across three different descriptive categories emerged from the data illustrating long-term bariatric patients experiences in regard to the notion of self and society: self-realization, self-reflection, and the self in relation to society.

The embodiment of 'self' was clearly demonstrated through the varied experiences of long-term bariatric patients. For example, many respondents noted body image dissatisfaction, which can impact psychological distress (Sarwer, Bishop-Gilyard, & Carvajal, 2014; Ortega et al., 2012). Excessive, loose skin from massive weight loss can impact many facets quality of life including physical, social and, psychological domains, which may impact long-term weight outcomes (Heidmann & Grønkjær, 2015; Ramalho et al., 2014). In general, removal of excess skin is considered a cosmetic procedure in the majority of cases and health insurance will typically not cover the costs of procedures.

Self-esteem has also been associated with adherence to post-operative dietary guidelines, which many individuals still reported coping with food or alcohol (Heinberg & Lavery, 2014; Wimmelmann, Dela, & Mortensen, 2014). Moreover, many respondents noted that weight regain after surgery carries a certain shame, which might have an effect on bariatric follow-up and support (Karmali et al., 2013). It is well documented that those that suffer from obesity face discrimination in society (Meana & Ricciardi, 2008; Puhl & Heuer, 2009). The respondents in this study noted that society treated them much more positively after surgery. The simple act of making eye contact, acknowledgement, or a simple smile allowed many respondents to simply *exist* in the world again.

The results of this study regarding various psychosocial outcomes for long-term bariatric patients do not necessarily paint a positive picture. The choice to undergo bariatric surgery is a life long commitment, and the results illustrate that physiological factors alone do not ensure long-term bariatric success. A major key to prevention of weight regain is continuing post-operative education and follow-up. Both before and after weight-loss surgery, patients need to be taught how to use their surgery to optimize their success involving the importance of dietary adherence, behavioral and psychological health, and physical activity. Many of the known negative psychosocial impacts of weight recidivism and a negative self-concept could potentially be mitigated by continuing education and follow-up regarding potential long-term issues that can have damaging consequences and ultimately place the patient back at the starting line.

Limitations

This study represents the first published attempt at empirical investigation using the survey instrument. Although, a pilot test was conducted prior to the start of the current study, further testing of the instrument is needed to assess accuracy and validity, as with other objective

bariatric measures. Additional limitations include self-reported long-term outcomes, and the potential for self-selection bias, where the participants' decision to participate may have had an affect on the study, as a non-representative sample. For example, those that returned questionnaires may have had strong opinions regarding their bariatric outcomes (positive or negative) and may have been more willing to give their time answering the questionnaire. A lack of baseline data to compare pre- and post-bariatric outcomes may further limit accuracy of responses. Finally, the generalizability of the results may be impacted, as the majority of respondents (n = 534) were from one U.S. Midwestern bariatric center with little ethnic diversity, which may not have been representative of the true essence of long-term bariatric outcomes.

Additionally, with regard to the qualitative data, the researchers acknowledge that due to the limitations of the data collection (restrictions of time, questionnaire items, and participant confidentiality), it was not feasible to achieve in-depth interviews with participants, and as such had to collect written responses instead. The researchers concede that although there may have been a lack of depth in the collected narratives, the extensiveness in the sheer quantity of responses may assist in mitigating the depth of descriptive essence. The open-ended question posed was very general, and the variety of responses was diverse across many different post-operative outcomes, therefore, descriptive findings for this study emerged out of plethora of various other topics, which respondents noted. Lastly, the qualitative analysis utilized a single-coder. Cope (2005) notes that although the researcher(s) acknowledge their background and intend to approach the data with an open mind, the researcher's prior experience and knowledge are part of the process. Replicating of findings by different researchers is unlikely and if individuals experience the phenomenon of bariatric surgery in the world in a certain way,

different researchers approaching the same phenomenon regarding a group of individuals' personal experiences are also going to experience the data in different ways (Cope, 2004).

Conclusion

Although it has been well established that bariatric surgery is essentially safe and effective for weight loss, many factors affect the outcomes of bariatric surgery and its long-term success. Regardless of surgery type, long-term bariatric success requires significant behavioral changes and is largely dependent on an individual's ability to implement permanent lifestyle changes, such as adhering to a strict nutritional and exercise regimen, and acquiring new coping skills to decrease reliance on food for addressing emotional needs (Bauchowitz, et al., 2005; Karmali et al, 2013). These are the often life-long eating patterns that must be altered with the altered physiological components of the procedure. Without addressing possible psychological issues, the patient may override the biological mechanism and regain weight, which may also bring the return of previously resolved health issues, such as Type II diabetes or hypertension, which were initially mitigated by the initial bariatric procedure. The researchers concur with the recommendations set forth by Abela and colleagues (2011) that a critical key to success for long-term bariatric patients is having access and care of multidisciplinary teams including a bariatric surgeon, gastro-intestinal specialist, endocrinologist, nutritionist, and psychiatrist at minimum. Moreover, there is a need for plastic surgeons to be included on the team as reconstructive surgery may have a positive impact on self-concept and other psychosocial outcomes.

It ought to be noted that although this study did not place an emphasis on the Social Cognitive Theory (SCT) except to guide instrument development, the reciprocal relationships between person, environment, and behavior, which SCT posits (Kaufman, 2007); may indeed suggest that patients receive at least a degree of reinforcement from behaviors such as physical

activity, adhering to the recommended post-surgery diet to tangible outcomes such as improved health and a more socially acceptable outward appearance. The construct of self-efficacy, which is embedded in the SCT posits that if an individual has the confidence in completing behaviors of personal significance (Kaufman, 2007), it should lead to accomplishment of behaviors such as regular post-surgery physical activity and control over eating behaviors. Considering the SCT and successful bariatric surgery outcomes, the reciprocal dynamics of the triad could possibly be explored as a model of the relationships between physical activity, well-being, mental health and food relationships, perceptions of 'self' and 'society,' personal relationships, and self-efficacy, and how these psychosocial factors influence bariatric outcomes.

In conclusion, though the researcher chose not to focus on age-specific outcomes in this study, it does not appear that age is a significant predictor of an individual's 'success' or 'failure' in choosing to pursue bariatric surgery. A significant amount of past research reviewed for this dissertation has demonstrated that bariatric surgery is a safe procedure for older adults. Moreover, the final regression model in Chapter V noted the variable pertaining to age was not a significant predictor of weight regain, even though it was included in the initial exploratory analysis of bivariate correlations for post-operative weight regain.

The researcher believes that once a bariatric patient's co-morbid conditions and health status improve in the first 12-18 months post-surgery (no matter the age), the patient must implement the necessary behavioral and lifestyle changes and get to the *root* of their struggles with obesity during this initial post-surgery time frame; when the physiological mechanisms of the surgery are the driving force. If these underlying psychological and psychosocial factors are not dealt with during the active weight loss period post-surgery, it may indeed interfere with one's long-term success at weight maintenance.

Moreover, Legenbauer and colleagues (2012) note that the most successful patients are younger than 40 years of age, with a pre-surgery BMI < 50, who are willing to change their eating habits, and significantly increase their physical activity levels post-surgery. Simply put, normal aging processes may be a factor in weight loss success (i.e. menopause), but the researcher posits that if one has spent the majority of their life engaging in disordered eating and sedentary behaviors, than psychosocial factors such as motivation, depression, self-esteem, other mental health issues etc. (Legenbauer et al., 2012) may indeed play a significant role in influencing successful long-term bariatric outcomes.

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APPENDIX A. IRB APPROVAL

NDSU NORTH DAKOTA STATE UNIVERSITY

April 2, 2014 FederalWide Assurance FWA00002439

Dr. Ardith Brunt
HNES

Re: IRB Certification of Exempt Human Subjects Research:
Protocol **#HE14235 , "Older adults fighting obesity with bariatric surgery: Benefits, side effects and outcomes"**

Co-investigator(s) and research team: **Cindy Marihart, Angela Geraci, Brent Hill, Mark Strand, Chris Ray**

Certification Date: 4/2/14 Expiration Date: 4/1/17
Study site(s): **varied**
Funding: **n/a**

The above referenced human subjects research project has been certified as exempt (category # 2) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, *Protection of Human Subjects*). This determination is based on the original protocol submission with revised consent (received 4/2/14).

Please also note the following:

- If you wish to continue the research after the expiration, submit a request for recertification several weeks prior to the expiration.
- Conduct the study as described in the approved protocol. If you wish to make changes, obtain approval from the IRB prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
- Notify the IRB promptly of any adverse events, complaints, or unanticipated problems involving risks to subjects or others related to this project.
- Report any significant new findings that may affect the risks and benefits to the participants and the IRB.
- Research records may be subject to a random or directed audit at any time to verify compliance with IRB standard operating procedures.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.
Sincerely,

Kristy Shirley

Kristy Shirley, CIP, Research Compliance Administrator

NDSU INSTITUTIONAL REVIEW BOARD
NDSU Dept 4000 | PO Box 6050 | Fargo ND 58108-6050 | 701.231.8995 | Fax 701.231.8098 | ndsu.edu/irb
Shipping address: Research 1, 1735 NDSU Research Park Drive, Fargo, ND 58102

APPENDIX B. LETTER OF SUPPORT FROM THE CENTER FOR WEIGHT MANAGEMENT

CATHOLIC HEALTH INITIATIVES

The Center for Weight Management

A Service of St. Joseph's Area Health Services

600 Pleasant Ave. Park Rapids, MN 56470

Phone: (218) 732-3311 Fax: (218) 732-1368

www.sjahs.org

Leah Walters, RD, LD, CDE

leahwalters@catholichealth.net

(218) 616-3375

4/14/14

Dr. Ardith Brunt, PhD., RD, Associate Professor

North Dakota State University

Health, Nutrition and Exercise Science

College of Human Development

351 EML, P.O. 6050

Fargo, ND 58108-6050

Dear Dr. Brunt,

The purpose of this letter is to show our support in working with Cindy Marihart and Angela Geraci on their dissertation research through North Dakota State University on, "Older adults fighting obesity with bariatric surgery: Benefits, side effects and outcomes." We have agreed to send out surveys to approximately 3,600 patients who have had bariatric surgery and are at least 18 months post-operative. The survey will be studying differences between our patients based on their age, specifically focused on weight loss, diet/exercise/vitamin adherence. Quality of life issues on comorbidities after surgery will also be compared by age groups. Additionally, personal relationships and bariatric support groups will be compared based on age.

We have chosen to partner with these students in the interest of furthering research on these very important questions. We have been part of the planning process and will continue to participate in survey question selection. We have agreed to honor the North Dakota State University Institutional Review Board (NDSU IRB) approval for the survey and the study. Our volunteers will place mailing labels on all correspondence to protect all HIPPA and data privacy of our patients and the results of the survey will be anonymous.

In an effort to assist with this worthwhile study, we will contribute financially by assisting with the cost of postage by off-setting staff costs with labeling and handling this mailed-out survey.

Sincerely,

Leah Walters

APPENDIX C. MATERIALS SENT TO POTENTIAL PARTICIPANTS

NDSU NORTH DAKOTA STATE UNIVERSITY

Dear Survey Participant,

You are invited to participate in a study on the experiences of patients who have had bariatric surgery at least 18 months previously. We are two doctoral students, in the College of Human Development and Education at North Dakota State University who have both had bariatric surgery and teamed up together to research bariatric surgery. We are working in cooperation with the Center for Weight Management in Park Rapids. We would like to learn more about your weight loss surgery and your post-surgical outcomes. The purpose of our research project is to gain more insight into the individual and personal experiences that only people who have had weight loss surgery undergo.

The criteria for participating in the study is that you must have had weight loss surgery at least 18 months ago and are over the age of 18. Your participation is entirely voluntary, and you may change your mind or quit participating at any time, with no penalty. However, your assistance would be greatly appreciated in making this a meaningful study. The responses to this survey study are completely anonymous so, you are free to answer candidly and openly. For this reason, we will not be asking you to sign a separate consent form to participate in this study, and your completion of the survey implies your consent. You may not receive direct benefit for participation in this study, but will be able to contribute your thoughts and opinions about your bariatric surgery experience so that society may also benefit from your knowledge. We have taken reasonable safeguards to minimize any known risks. These known risks include: you may feel slightly uncomfortable answering some questions.

When writing the study results, your information will be combined with information from other participants taking part in the study and you will not be identified in these written materials. We intend to publish the results of the study. For questions about the rights of human participants in research, or to report a complaint about the research, please contact the NDSU Human Research Protection Program, at ndsu.irb@ndsu.edu or call (701) 231.8908. You may also contact our advisor, Ardith Brunt, PhD at (701) 231.7475 or Ardith.Brunt@ndsu.edu.

We greatly appreciate your participation in this study and we thank you for your time and effort. We also thank the Center for Weight Management in Park Rapids for making this study possible. If you wish to receive a copy of the research results, please email either Cindy or Angela at cindy.marihart@my.ndsu.edu or angela.geraci@my.ndsu.edu.
If you would prefer to take the survey online, you may complete it at:
http://tinyurl.com/bariatric-survey

Best regards,
Cindy Marihart and Angela Geraci

DEPARTMENT OF HEALTH, NUTRITION, AND EXERCISE SCIENCES
NDSU Dept 2620 | PO Box 6050 | Fargo ND 58108-6050 | 701.231.7487 | Fax 701.231.6347 | www.ndsu.edu

Background Information

Please write in or circle your answer:

1) What is your age? _____

2) What is your gender?

- ❍ Woman
- ❍ Man
- ❍ Decline to answer

3) What is your highest level of education completed?

- ❍ Less than high school
- ❍ High school diploma / GED
- ❍ Some college or degree (AA, AS)
- ❍ College degree (BA, BS) or above

4) What is your marital status?

- ❍ Single, never married
- ❍ Married
- ❍ Domestic partnership
- ❍ Separated
- ❍ Divorced
- ❍ Widowed

5) What is your employment status?

- ❍ Caregiver at home
- ❍ Work Part-time
- ❍ Work Full-time
- ❍ Retired
- ❍ Other

6) When was your bariatric surgery? (month/year)

_____/_____

7) What type of surgery did you have? (most recent surgery)

- ❍ Gastric Bypass
- ❍ Gastric Sleeve
- ❍ Laparoscopic Gastric Band
- ❍ Biliopancreatic diversion with duodenal switch
- ❍ Other (please specify):

  _____

8) What is your height (in feet/inches)?

_____

9) What is your current weight?

_____

10) What was your weight at the time of your surgery?

_____

11) What was your highest weight before surgery?

_____

12) What was your lowest weight achieved after surgery?

_____

Post-Bariatric Survey

1) Have you seen changes in any of the following since surgery?

Mark an 'X' in the box indicating your answer for the following chronic conditions:

	Much Worse	Worse	About the Same	Better	Much Better	N/A
Arthritis / joint pain						
Asthma / respiratory disease						
Chronic renal failure						
Depression						
Diabetes, type II						
Fatty liver disease						
Gall bladder disease						
Heart disease						
High blood pressure / hypertension (even if treated)						
Sleep apnea						
Other:						

2) Are you satisfied with your weight loss since your surgery?

- ❍ Very Dissatisfied
- ❍ Dissatisfied
- ❍ Neutral
- ❍ Satisfied
- ❍ Very Satisfied

3) How did your overall health change after surgery?

- ❍ Much Worse
- ❍ Worse
- ❍ About the Same
- ❍ Better
- ❍ Much Better

4) How has your ability to move around changed after surgery?

- ❍ Much Worse
- ❍ Worse
- ❍ About the Same
- ❍ Better
- ❍ Much Better

5) How is your energy level since surgery?

- ❍ Much Worse
- ❍ Worse
- ❍ About the Same
- ❍ Better
- ❍ Much Better

6) How has your sleep changed since surgery?

- ❍ Much Worse
- ❍ Worse
- ❍ About the Same
- ❍ Better
- ❍ Much Better

7) Over the past week, how many minutes of moderate to vigorous activity (exercise) have you participated?

- ❍ 0
- ❍ Less than 30
- ❍ 31 - 60
- ❍ 61 - 90
- ❍ 91 - 120
- ❍ More than 120

8) How happy are you with your bariatric surgery?

- ❍ Very Unhappy
- ❍ Unhappy
- ❍ Neither Happy nor Unhappy
- ❍ Happy
- ❍ Very Happy

9) If you had to do it over again, would you still have bariatric surgery?

- ❍ Very Unlikely
- ❍ Unlikely
- ❍ Undecided
- ❍ Likely
- ❍ Very Likely

10) Over the past month, how often do you follow your bariatric eating plan?

- ❍ Never
- ❍ Rarely
- ❍ Sometimes
- ❍ Often
- ❍ Almost Always

11) Over the past month, how many 8- ounce cups of liquid did you drink daily?

- ❍ 0 - 2 cups
- ❍ 3 - 4 cups
- ❍ 5 - 6 cups
- ❍ 7 - 8 cups
- ❍ more than 8 cups

12) Over the past month, how often do you take the recommended vitamin and mineral supplements after surgery?

- ❍ Never
- ❍ Rarely
- ❍ Sometimes
- ❍ Quite Often
- ❍ Very Often

13) Over the past month, how many grams of protein did you eat daily?

- ❍ Less than 50
- ❍ 50 - 60
- ❍ 61 - 80
- ❍ 81 - 100
- ❍ More than 100

14) Over the past month, how often do you eat the foods listed below?

Mark an 'X' in the box indicating your answer for the following foods:

	Never	Less than Once a Month	2-3 Times a Month	Once a Week	2-3 Times a Week	Daily
Fruits						
Vegetables						
Milk and dairy foods						
Breads, pasta, rice						
Meat						
Fish						

15) Since your surgery, have you had any of the following symptoms?

Mark an ‘X’ in the box indicating your answer for the following symptoms:

	Never	Rarely	Sometimes	Most of the Time	Always
Nausea (In last year)					
Indigestion					
Heartburn					
Vomiting					
Constipation					
Diarrhea					
Gas/belching/flatulence					
Bladder problems / urinary incontinence					
Gallstones (or gallbladder removed)					
Hair loss					
Other:					

16) How would you rate the support you have received from your personal relationships since your surgery? Mark an 'X' in the box indicating your answer for the following relationships:

	Much Weaker	Somewhat Weaker	No Change	Somewhat Stronger	Much Stronger	N/A
Spouse/ Significant other						
Parents						
Siblings						
Children						
Other Family						
Grandparents						
Friends						
Co-workers						
Employer						

17) How has your self-esteem changed since you've lost weight?

- ❍ Much Lower
- ❍ Slightly Lower
- ❍ About the Same
- ❍ Higher
- ❍ Much Higher

18) In regards to the way you look and feel since your surgery, how happy are you?

- ❍ Very Unhappy
- ❍ Unhappy
- ❍ Neither Happy nor Unhappy
- ❍ Happy
- ❍ Very Happy

19) How would you rate your overall sense of well-being in the last month?

- ❍ Much Worse
- ❍ Worse
- ❍ About the Same
- ❍ Better
- ❍ Much Better

20) How would you rate your satisfaction with leisure time activities since you have lost weight?

- ❍ Very Dissatisfied
- ❍ Dissatisfied
- ❍ Neutral
- ❍ Satisfied
- ❍ Very Satisfied

21) Since your surgery, do you feel healthier?

- ❍ Never
- ❍ Rarely
- ❍ Sometimes
- ❍ Often
- ❍ All of the Time

22) Since your surgery, do you feel you have a better outlook on life in general?

- ❍ Much Worse
- ❍ Worse
- ❍ About the Same
- ❍ Better
- ❍ Much Better

23) Since your surgery, do you feel better about your future as you age?

- ❍ Much Worse
- ❍ Worse
- ❍ About the Same
- ❍ Better
- ❍ Much Better

24) Since your surgery, how would you rate your confidence in yourself?

- ❍ Much Worse
- ❍ Worse
- ❍ Somewhat Worse
- ❍ About the Same
- ❍ Somewhat Better

25) How often do you go to face-to-face support groups?

- ❍ Weekly
- ❍ Once a Month
- ❍ Every Few Months
- ❍ Couple times per year
- ❍ Never

26) How often do you participate in an online support group?

- ❍ Daily
- ❍ Weekly
- ❍ Once a Month
- ❍ Every Few Months
- ❍ Never

27) What else would you like to tell us about your bariatric surgery experience?

_____

_____

_____

_____

28) Would you like a bariatric professional to contact you about any concerns? If so, please list your name and phone number below and tell us the best time to contact you.

_____

_____

_____

_____

APPENDIX D. SOCIAL COGNITIVE THEORY CONSTRUCTS OF THE QUESTIONNAIRE

Construct	Definition	Application to Survey Question
Environment	Factors physically external to a person	Questions: 26, 27, 30, 31
Expectations	Anticipated outcomes of a behavior	Questions: 1, 4, 5, 7, 8, 9, 10, 19, 20, 21
Expectancies	Values placed on a given outcome	Questions: 2, 3, 6, 15, 22, 23, 24, 25
Self-Control	Self-regulation of a behavior	Questions: 12, 14, 16, 17, 18, 28
Emotional Coping Responses	Strategies used to manage emotional stimuli	Questions: 36, 37
Reinforcement	Responses to behavior that will increase or decrease likelihood of behavior's occurrence	Questions: 32, 33, 34, 35
Self-Efficacy	Confidence in the ability to perform the behavior	Questions: 11, 13, 29

Note. Adapted from Glanz, K., Rimer, B. K., & Lewis, F. M. (2008). *Health behavior and health education: Theory, research, and practice*. San Francisco: Wiley & Sons.