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The Need For Exercise Prescription For Bariatric Patients

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***Abstract*—The focus of this thesis is to draw attention to the value of exercise prescription for bariatric patients following surgery and its profound effects on their health and well-being. The literature review explored several articles and gave a thorough analysis of the detrimental effects of chronic obesity with regard to cardiometabolic disorders. This review also explored methods of estimating body composition and the various options for bariatric surgery along with common complications from the surgeries. The student researcher attended a support group session at a local bariatric clinic to explain exercise recommendations and ask patients to define their perceived barriers to exercise. This information was used, along with current published exercise guideline literature for obese/bariatric populations to formulate recommended best practices for exercise prescription. Exercise can help these patients manage their weight, enhance their quality of life, and overcome obstacles they may encounter after having bariatric surgery. The advantages of exercise for bone health, physical fitness, and psychological well-being are also covered. Included are examples of specific resistance exercises this population may benefit from. The result of this thesis describes how exercise prescription for bariatric patients has a variety of beneficial effects, including changing perceptions of obesity and encouraging a healthy, active lifestyle. It highlights the benefits of exercise for long-lasting improvement and holistic care. This research stresses the significant impact an exercise professional can make regarding the health and wellness of a bariatric patient.**

Keywords—Bariatric surgery; obesity; exercise prescription; surgery; cardiometabolic disease

I. Introduction

Exercise has a direct effect on metabolic and cardiovascular activities. Older adults with high blood pressure are likely to develop health complications in clustering of central obesity, insulin resistance, dyslipidemia and others. Prescription of appropriate exercise is key to maximize the lower risk factors associated with metabolic and cardiovascular diseases. Physical activity is known to reduce the risk of disease and maintain or increase bone and muscle mass and improve mental state [1]According to [1]older adults with underlying conditions are more likely to develop a number of associated risks that militate against the benefits of physical activity. Exercise is a verifiable tool for ameliorating risk factors. An increase in risk factors for metabolic and cardiovascular disease are associated with obesity and/or aging [1]Therefore, it is pertinent to design exercise routines in such a way that effectively combats these risk factors. Exercise, well prescribed, could substantially improve body functionalities, reduce abdominal and visceral fat [2].

II. Introduction to Bariatric Surgery

Measurement and determination of body composition

Administration of questionnaires is discouraged in eliciting weight information from people. Many times, weight-related data are obtained directly from measurement procedures.

Body composition is a crucial component of health that is connected to dietary status. To determine body composition, several techniques have been developed. Body mass index (BMI) is a tool that healthcare providers use to estimate the amount of body fat by using your height and weight measurements. BMI can help assess risk factors for certain health conditions. An example of BMI is given in Table 1. The assumptions, calibration, accuracy, and precision of each of these procedures are each subject to certain constraints. It is possible to identify the fat and lean components of soft tissue using a variety of approaches. Hydrodensitometry (also known as underwater weighing), compartment models with various dilution procedures, neutron activation studies, electrical conductance, imaging approaches, infrared interactance, and anthropometry are a few of these [3].

In recent years, aside from the measurement of bone mineral density, the dual-energy X-ray absorptiometry (DEXA) approach rose to prominence in body composition analysis (BCA). Comparing it to in-vivo or in-vitro multiple component reference techniques, it has been stated that its results are highly accurate and exact. On the other hand, methods such as bioelectrical impedance (BIA) and skin-fold thickness (SFT) approaches are straightforward, easily accessible, and non-invasive, plus they have the benefit of being radiation-free [3]

Table 1: Body Mass Index (BMI) Chart

BMI (Kg/m^2)	Weight Class
<18.5	Underweight
18.5 – 24.9	Normal weight
25.0 – 29.9	Overweight
≥30	Obese
30.0 – 34.9	Obese Class I
35.0 – 39.9	Obese Class II
≥40	Obese Class II

A. Types of bariatric surgery

An individual with a body mass index of 30 and more is considered obese, therefore such an individual is at risk of type 2 diabetes and cardiovascular diseases. Therefore, such an individual has met the criteria for the consideration for bariatric surgery in order to reduce his/her weight and improve his/her health.

By limiting the number of calories a person can consume (restrictive treatment) or decreasing the quantity of calories absorbed from the digestive tract (malabsorptive technique), bariatric surgery aims to reduce caloric intake. There are several ways to achieve this. The Roux-en-Y gastric bypass (RYGBP) (restrictive and some malabsorptive), laparoscopic adjustable banding (LAGB) (restrictive only), and biliary-pancreatic diversion with duodenal switch (BPD/DS) (malabsorptive and some restrictive) are the methods that are most frequently discussed[4]
Thus, more people are deciding to undergo bariatric surgery to lose weight. Although generally secure and productive, there is always the need to improve outcomes and mitigate negative effects. Endoscopic trans-gastric surgery, a procedure to shrink the pig stomach, is currently being developed (Lee et al., 2007).[4] Transgastric surgery has the potential to improve outcomes, hasten the procedure, and lessen challenges. But this technique is still in its early stages of development [5].

Regardless of the type of treatments utilized, there is strong evidence that surgery improves type 2 diabetes and weight loss outcomes more than nonsurgical approaches. There are several types of bariatric surgery, however, sleeve gastrectomy and gastric bypass are the two most popular surgeries currently performed. Both show comparable effectiveness on weight reduction and diabetes outcomes as well as comparable safety during at least 5-year follow-up [6].

III. Medical Complications of Bariatric Surgery

Weight loss surgery has received much attention in the last few days due to its high effectiveness. Although these operations can be effective, they are technically challenging and can lead to a number of complications. Regrettably, these issues might occasionally be modest and challenging to detect early. For instance, tachycardia above 120 bpm may be the most accurate indicator of intra-abdominal sepsis caused by a surgical leak or abscess. These patients have a limited physiologic reserve, therefore it's critical that complications be detected quickly and treated correctly. Despite the numerous techniques, bariatric surgery consequences often manifest in one of five non-specific ways: abdominal pain, suboptimal weight loss, diarrhea, gastrointestinal bleeding, or wound infections.

A. Post-bariatric Surgery Diarrhea

This symptom might be a physiological reaction to the surgery due to malabsorption/maldigestion, bile salt diarrhea, or dumping syndrome. Dumping syndrome should be taken into account the most frequently. While most gastric bypass patients will encounter this side effect during the first 18 months, persistent dumping syndrome occurs 5–10% of the time. When sweets and processed carbohydrates are consumed, symptoms such as facial flushing, dizziness, weariness, and postprandial diarrhea appear. In most cases, dumping syndrome is avoided by having a pylorus with the duodenal switch. In this procedure, the pylorus, a muscle valve that controls food flow from the stomach to the small intestine, is either surgically altered or bypassed during the duodenal switch treatment. This modification enables a change in the regular digestion process, which lowers calorie absorption and may lead to weight loss.

Other possibilities include post-operative food intolerances that either already existed or developed before surgery, irritable bowel syndrome that was made worse by the procedure, and both. Based on the intensity of the symptoms, the diagnostic process should be adjusted. In less severe cases, symptoms are typically lessened by empiric therapy with antibiotics/probiotics for bacterial overgrowth or dietary adjustment to prevent dumping syndrome (changing the mix of meals, ingesting carbs in the middle of meals, and eating slowly). Avoiding dietary intolerances and using anticholinergic medication on an as-needed basis are both appropriate solutions. Regardless of the source of the diarrhea, it is important to check that patients are not experiencing nutritional or metabolic side effects from their bariatric surgery [4].

B. Suboptimal Weight Loss

After RYGBP bariatric surgery, weight reduction starts off quickly and then gradually decreases over the course of the first year, plateauing for the majority of patients by 18 months. Two to three years following surgery, weight increase is not uncommon. However, a workup for leaks and fistulas by UGI series normally should be prompted by early or unexpected weight gain. Weight gain may be caused by food entering the excluded stomach as a result of staple line dehiscence or a gastro-gastric fistula. Pouch expansion, band slippage, or inadequate restriction are reasons after LAGB. The most likely cause of weight increase is dietary noncompliance if there is no anatomical cause for the weight gain [4].

Wound infection and dehiscence

Surgical diagnosis and treatment are required for facial dehiscence, which affects up to 1% of people. The need for mesh repairs is widespread since re-approximation frequently fails and can be compounded by abdominal compartment syndrome [4].

C. Gastrointestinal Bleeding

Significant bleeding that occurs in the first 72 hours after surgery is typically brought on by an intraoperative problem or anastomotic ischemia. With a low threshold for early reoperation using intraoperative or laparoscopic-assisted endoscopy, peroral endoscopy should be avoided at this time. The risk of perforation at the gastro-jejunal anastomosis or the gastric remnant may rise due to temporary blockage from a clot at the jejuno-jejunal anastomosis. Erosion and ulceration at band sites or anastomoses (marginal ulcer) happen between 72 hours and 1 week. Although it could be technically difficult, endoscopy, especially push enteroscopy to inspect the Roux limb, is acceptable at this time. A typical upper endoscope enables inspection of the gastrojejunal anastomosis and the proximal Roux limb in RYGBPs [4].

IV. Postsurgical Treatments of Bariatric Patients

Specific instructions are provided by current clinical guidelines for the monitoring and treatment of patients who had bariatric surgery in order to further enhance post-operative health advantages in terms of changes in body weight and fat mass, muscular mass and strength, physical fitness, and bone mineral density [7].

A. Prescription of Exercise and Bodily Rehabilitation Following Bariatric Surgery

Decreases in muscle mass as a result of bariatric surgery are responsible for 10–28% of the total body weight reduction. In addition, research indicated that following a year of a sleeve gastrectomy, the prevalence of sarcopenia increased from 8% to 32%. Clinical professionals might investigate more thoroughly if severe muscle wasting is taking place when large losses in muscular strength are seen in conjunction with significant reductions in functional capacity/exercise capacity. They could then take appropriate action. Considering that muscle atrophy or (in a more advanced state) obese sarcopenia is independently linked to a number of negative consequences including a 24% increased risk for premature mortality, therefore, it is important to address and prevent these conditions through appropriate interventions and lifestyle changes [7].

Additionally, bariatric surgery results in notable decreases in bone mineral density, which increases the risk of bone fractures. As a consequence, physicians should take into account the evaluation of physical activity and fitness, muscular strength and mass, and bone mineral density while monitoring patients who have undergone bariatric surgery [7].

B. Importance of Physical Activity and Exercise Intervention After Bariatric Surgery

When applied to obese individuals, a lifestyle intervention's long-term effects—a mix of calorie restriction and increased physical activity—are frequently modest. On the other hand, bariatric surgery is quite successful in helping these patients lose extra body weight. For example, laparoscopic vertical sleeve gastrectomy excess weight loss varies from 70 to 83%, and laparoscopic Roux-en-Y gastric bypass excess weight loss ranges from 60 to 86% [7]. However, in some patients, major weight recovery and other long-term negative consequences might be observed following this first phase of rapid weight loss.

Thus, recommendations on implementing post-bariatric follow-up procedures have been suggested as a way to improve patient outcomes. These recommendations call for close monitoring of glycemic control, blood lipid profile, obstructive sleep apnea, gastroesophageal reflux disease, body weight, quality of life, nutritional state, eating behavior, and bone health [7].

Physical exercise boosts overall energy expenditure, results in a 4.2% larger BMI decrease one year after bariatric surgery and avoids weight gain over the first two years [7]. Additionally, such treatments contribute to a better preservation of muscular strength, muscle mass, endurance capacity, and bone mineral density, as well as an improved quality of life. Finally, physical activity levels independently correlate with a decreased risk of early mortality, complications, the need for hospitalization, and other healthcare expenditures in individuals with obesity or other chronic conditions.

B. The importance of weight management

Studies that yield subpar findings frequently cast doubt on the therapeutic importance of weight maintenance and weight reduction. For the purpose of preventing weight gain, weight reduction, and weight return following weight loss, physical activity (PA) is advised as a part of weight management. For people who are overweight or obese, the American College of Sports Medicine (ACSM) released a Position Stand in 2001 recommending at least 150 minutes per week of moderate-intensity PA to enhance health, but 200 to 300 minutes per week for long-term weight loss. More recent research has confirmed this advice and shown that more PA may be required to prevent weight gain following weight reduction [8].

There is evidence that suggests moderate-intensity PA between 150 and 250 minutes per week can help people avoid gaining weight. Only minimal weight reduction will result with moderate PA between 150 and 250 minutes per week. Clinically substantial weight reduction has been linked with higher PA (>250 minutes per week) levels [8] Because multiple studies have demonstrated the positive effects of

decreased weight and body fat in overweight and obese persons, management of overweight and obesity is recognized as an important public health endeavor. These positive outcomes include a reduction in CVD risk variables such as blood pressure, LDL cholesterol, and triglycerides (TG) [8]. [9]studied women who had recently lost 23±9 kg of weight to determine the amount of calories required to avoid weight gain. The amount of PA that allowed for the greatest distinction between gainers and maintainers was found through retrospective studies of the data. These calculations led to the conclusion that in order to prevent weight gain, inactive people would need to engage in around 80 minutes of moderate-intensity or 35 minutes of strenuous physical activity per day [9]. These studies supported the ACSM's 2001 recommendation of 200–300 minutes per week of moderate-intensity PA for long-term weight loss, and additional published recommendations (such as those from the Institute of Medicine) imply that higher PA dosages may be required to prevent weight gain after weight loss [8].

V. Recommendations for Exercise Prescription for Post-bariatric Patients

The best exercises to perform can vary depending on a person's specific circumstances and goals, taking into account things like past injuries and the stage at which you are in your exercise regimen. Appropriate levels of physical activity to support weight management, prevent weight gain, and improve overall health outcomes is necessary in prescribing exercise not only for post-bariatric patients but for every individual interested in engaging in exercise for weight loss.

The American Metabolic and Bariatric Surgery Society (ASMBS) specifically advises preoperative exercise as well as a progressive walking program that starts on the first day after bariatric surgery and incorporates both aerobic and strength training exercises for ≥ 30 minutes per day [10].

Therefore, according to In et al., (2021), the following types of moderate cardiovascular exercise are recommended for post-bariatric patients; walking, jogging on a treadmill, cycling one hour per day, three times a week. Post-bariatric patients are encouraged to engage in cardiovascular exercise three to five days per week, with the frequency progressively rising as their fitness level rises. Starting with a moderate intensity and increasing to vigorous levels as their comfort and abilities allow is important. The Rate of Perceived Exertion (RPE) scale should be used to determine how hard they are working.

Furthermore, resistance exercise training is an important aspect of post-bariatric patient care, it involves strength training to promote lean muscle growth, improve overall strength, and achieve good body composition. The FITT (frequency, intensity, type and time) concept must be carefully followed to provide a comprehensive and successful resistance workout program. It is advised that post-bariatric patients engage in resistance exercise training two to three days a week, allowing for recovery between training sessions. The intensity of the exercise should be adjusted according to the patient's degree of fitness to allow for their strength and comfort beginning with low intensity. Regarding time, careful consideration must be given to how long a resistance training session should last. Depending on the patient's level of fitness, the number of exercises performed, and the rest periods in between sets, each session might last from 20 to 60 minutes three times a week or 30-35 minutes for the first week after surgery in order to prevent injury. The secret to maximizing the efficacy of each session is to place an emphasis on quality repetitions rather than fast movements. For post-bariatric patients, concentrating on type of exercise that enhances their total body, use major muscle groups and foster functional strength is essential. Exercises like lunges, which work the lower body muscles and improve balance, chest presses, which target the upper body, and lat pulldowns or seated rows, which helps the upper back and biceps, shoulder presses, leg presses or curls, abdominal crunches, and planks are all important [7], [11]. These recommendations are made based on the articles cited above and general guidelines.

Conclusions

In essence, the prescription of exercise for bariatric patients goes beyond simple advice and becomes an essential part of their comprehensive care. Considering the effectiveness in promoting weight loss and enhancing overall health outcomes, bariatric surgery is unquestionably a life-changing experience. The ability of surgery to completely change a patient's life should not obscure the crucial part that exercise plays in their long-term health and wellbeing.

For bariatric patients, exercise prescription acts as a guiding light toward sustainable weight management, preventing weight gain, and improving quality of life. It includes a tailored strategy that acknowledges the special conditions and difficulties that every person faces after surgery. Bariatric patients can benefit in a variety of ways from exercise. The improvement of physical fitness enables individuals to embrace newly discovered strength, endurance, and flexibility. Their bones get stronger, and their muscles become more durable, protecting them from the consequences of being overweight. These patients' psychological health is also fostered, as exercise becomes a potent tool for enhancing self-esteem, improving body image, and reducing stress and anxiety.

The strands of empowerment, resiliency, and optimism are woven together in this transformational masterpiece by exercise prescription. It is a monument to the persistent dedication of medical practitioners who understand that movement has restorative benefits that go far beyond physical change. By accepting exercise as a crucial component of the bariatric journey, we set out on a

common mission to reframe the story of obesity in a way that emphasizes holistic care and the possibility of long-lasting improvement.

In conclusion, scientific data and the innate desire for a vigorous, healthy life support the need for exercise prescription for bariatric patients. It is a rallying cry for medical practitioners to embrace exercise's enormous potential as an essential component of post-surgical treatment. By doing this, we set out on a transformative journey that benefits bariatric patients and establishes the standard for a time when exercise and wellbeing happily coexist.

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REFERENCES

[1] K. J. Stewart *et al.*, "Exercise and risk factors associated with metabolic syndrome in older adults," *Am J Prev Med*, vol. 28, no. 1, pp. 9–18, Jan. 2005, doi: 10.1016/j.amepre.2004.09.006.

[2] C. M. Hales, M. D. Carroll, C. D. Fryar, and C. L. Ogden, "Prevalence of Obesity Among Adults and Youth: United States, 2015-2016 Key findings Data from the National Health and Nutrition Examination Survey," 2015. [Online]. Available: https://www.cdc.gov/nchs/data/databriefs/db288_table.pdf#1.

[3] T. Erselcan, F. Candan, S. Saruhan, and T. Ayca, "Comparison of Body Composition Analysis Methods in Clinical Routine," *Source: Annals of Nutrition & Metabolism*, vol. 44, no. 5, pp. 243–248, 2000, doi: 10.2307/48513900.

[4] J. K. Lee, Y. S. Park, K. Kim, T. J. Oh, and W. Chang, "Comparison of Bioelectrical Impedance Analysis and Computed Tomography on Body Composition Changes Including Visceral Fat After Bariatric Surgery in Asian Patients with Obesity", doi: 10.1007/s11695-021-05569-6/Published.

[5] W. Wassef, "Complications of bariatric surgery Related papers."

[6] D. E. Arterburn, D. A. Telem, R. F. Kushner, and A. P. Courcoulas, "Benefits and Risks of Bariatric Surgery in Adults: A Review," *JAMA - Journal of the American Medical Association*, vol. 324, no. 9. American Medical Association, pp. 879–887, Sep. 01, 2020. doi: 10.1001/jama.2020.12567.

[7] D. Hansen *et al.*, "Towards Optimized Care After Bariatric Surgery by Physical Activity and Exercise Intervention: a Review," *Obesity Surgery*, vol. 30, no. 3. Springer, pp. 1118–1125, Mar. 01, 2020. doi: 10.1007/s11695-020-04390-x.

[8] J. E. Donnelly, S. N. Blair, J. M. Jakicic, M. M. Manore, J. W. Rankin, and B. K. Smith, "Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults," *Medicine and Science in Sports and Exercise*, vol. 41, no. 2. pp. 459–471, Feb. 2009. doi: 10.1249/MSS.0b013e3181949333.

[9] D. A. Schoeller, K. Shay, and R. F. Kushner, "How much physical activity is needed to minimize weight gain in previously obese women?13," 1997. [Online]. Available: https://academic.oup.com/ajcn/article-abstract/66/3/551/4655764

[10] G. In *et al.*, "Comparison of 12-Week Fitness Protocols Following Bariatric Surgery: Aerobic Exercise Versus Aerobic Exercise and Progressive Resistance," *Obes Surg*, vol. 31, no. 4, pp. 1475–1484, Apr. 2021, doi: 10.1007/s11695-020-05144-5.

[11] F. Gallé *et al.*, "An exercise-based educational and motivational intervention after surgery can improve behaviors, physical fitness and quality of life in bariatric patients," *PLoS One*, vol. 15, no. 10 October, Oct. 2020, doi: 10.1371/journal.pone.0241336.