

# How to Help My Older Patient With Obesity Lose Weight Safely When the Evidence Is Not Clear

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Until recently, despite the deleterious the health consequences of their obesity, intentional weight loss by older adults usually was not recommended. Factors such as maladaptive metabolic changes and declines in physiologic function predispose this population to sarcopenic obesity, frailty, and impaired mobility, while accumulation of chronic comorbidities often results in polypharmacy. These considerations and more complicate both the decision to pursue weight loss and the safest method of doing so. Currently, specific guidelines for managing weight loss in older adults with obesity are widely lacking. We present a case from our Family Medicine practice of an older woman with obesity struggling with weight management. We present our recommendations for safely navigating the weight loss she desires using an evidence-based approach that incorporates a medically supervised calorie restricted diet, improved diet quality, and healthy physical activity recommendations that include resistance exercise. *Nutr Today* 2022;57(6): 317–328

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The authors have no funding or conflicts of interest to disclose.

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DOI: 10.1097/NT.0000000000000568

Obesity continues to be a growing public health concern, resulting in increased health risks and substantial economic burden among older Americans. As life expectancy and rates of obesity increase, so too does the proportion of the older adult population for whom weight is a significant concern.<sup>1</sup> From 1999–2000 through 2017–2018, proportions of the adult population with both obesity and severe obesity increased, with the prevalence of obesity in 2017–2018 estimated at 42.8%, and of severe obesity at 5.8%, among those 60 years and older.<sup>2</sup> These trends indicate that aging adults are at significant risk for obesity-related complications secondary to age-related degenerative and metabolic changes, complicating the decision to encourage weight loss. Healthcare professionals, including clinicians, are asking if obesity in this age group can effectively and safely be treated, considering the evidence that weight loss in older adults is associated with an increased risk of frailty and premature death.

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Although evidence-based guidelines for the management of overweight and obesity have been available since 1998, they have either not specifically addressed the safety and efficacy of caloric restriction in the management of individuals older than 65 years or suggest that the safety was controversial.<sup>3–8</sup> In 2012, The European Association for the Study of Obesity (EASO) recommended that obesity treatment should be offered only to older adults who have functional impairments, metabolic complications, or obesity-related diseases that can benefit from weight loss.<sup>9</sup> The set of guidelines issued by EASO focused on the prevalence, pathophysiology, health consequences, and treatment options for obesity in older adults. It noted that therapy should aim to minimize muscle and bone loss. Their report ended with a call for research to define

obesity in the older adult population, identify clinical tools for evaluating sarcopenia, and determine the optimal diet, pharmacotherapy, and cost-benefit for obesity management in older adults.<sup>9</sup>

By 2018, researchers suggested that the evidence, although limited, was sufficient to conclude that intentional weight loss in older adults could be safe and have positive effects on relevant health-related outcomes, including physical function and cardiovascular parameters<sup>10–13</sup>; however, the controversy continued. The 2019 Guidelines on Clinical Nutrition and Hydration in Geriatrics issued by the European Society for Clinical Nutrition and Metabolism<sup>1</sup> included 4 specific recommendations for obesity treatment in older adults. Notably, it suggested that “weight-reducing diets should only be considered in obese older persons (BMI > 30 kg/m<sup>2</sup>) with weight-related health problems.” Furthermore, the European Society for Clinical Nutrition and Metabolism noted that before intervening, risks and benefits should be assessed, such as “individual functional resources, metabolic risk, comorbidities, and the patients’ perspective and priorities,” as well as quality of life (QoL).

Despite the controversy over promoting weight loss in the older adult with obesity, emerging research shows that modest weight loss can positively impact health-related QoL in older adults. We present the case of an older woman with severe obesity desiring modest, sustainable weight loss, who receives care in our Family Medicine Geriatric practice. We cite the literature supporting our decision to individualize her obesity treatment plan through modest caloric restriction, improvements in dietary quality, and targeted resistance and other exercise interventions.

Recognizing that more than 61% of older Americans have a low-quality diet,<sup>14</sup> we discuss nutrients of particular concern in older adults with obesity, including protein and the amino acid leucine, calcium, and vitamin D, as well as evidence-based healthy dietary patterns. Increasing protein intake will probably help preserve muscle strength and quality, and supplemental

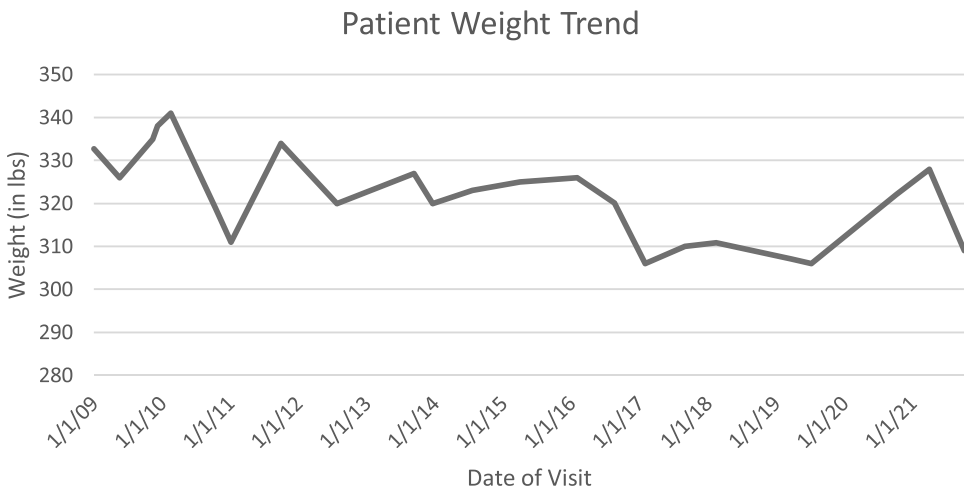
additions of amino acids, calcium, and vitamin D may further mitigate the negative effects associated with weight loss.<sup>15,16</sup>

We also describe the type of physical activity demonstrated to protect against bone loss during weight loss therapy for older adults with obesity, and which modalities may be available for those unable or unwilling to exercise. We will not discuss pharmacotherapy for treating obesity, as it is not indicated for this age group,<sup>17</sup> nor will we discuss bariatric surgery, which may be an option for patients who have failed conservative treatment.<sup>17</sup> Pursuing surgical intervention requires assessment and follow-up with a multidisciplinary team to ensure patient safety.

CASE INTRODUCTION

Ms PC is a 66-year-old woman who has been followed in our outpatient Family Medicine clinic for over 15 years. Her medical history is significant for hypertension (HTN), severe obesity, hyperlipidemia, hepatic steatosis, obstructive sleep apnea, chronic pain secondary to degenerative joint disease, delayed gastric emptying, and asthma. She and her medical providers agree that many of her chronic illnesses and her QoL would benefit from weight loss—the benefits outweighing the risks of modest weight loss. Despite years of trying to better manage her weight, her body mass index (BMI) remains 39 kg/m<sup>2</sup>. The Figure reflects her weight history.

*She and her medical providers agree that many of her chronic illnesses and her QoL would benefit from weight loss—the benefits outweighing the risks of modest weight loss.*



**FIGURE.** Patient weight fluctuations over time. Despite various attempts at improving weight management, the patient has continued to fluctuate between 306 lb (achieved in January 2019 and July 2019) and 341 lb (reached in February 2010) over the past 12 years, remaining at a body mass index that is considered “extremely obese” for her demographic profile.

Ms PC completed a weight loss readiness quiz with her family physician, and her score indicated she was ready to make lifestyle changes that would lead to a modest weight loss. Ms PC's physician then referred her for a visit with our registered dietitian nutritionist (RDN). Before her visit, she was asked to keep a 5-day diet diary and to fast for 8 hours before the visit to allow for resting energy expenditure (REE) measurement.

Ms PC currently takes multiple medications to manage her blood pressure, lipid levels, asthma, ongoing nausea secondary to delayed gastric emptying, and chronic pain. None of her medications are known to increase weight gain or inhibit weight loss. She also takes dietary supplements recommended by her physicians, including vitamin E 90 mcg (200 IU) twice daily and vitamin D<sub>3</sub> 25 µg (1000 units) daily.

She lives alone and often picks up her lunch from local eating establishments for convenience, but sometimes cooks 1 meal-per-day at home. She is a retired school social worker and is grieving the recent loss of both her mother and her sister. She had retired to care for her ill sister, and although she keeps herself busy reading, doing math puzzles, and watching movies, she has not yet settled into any particular activity schedule. Of note, she has adequate financial resources and is food secure.

Previous attempts at weight loss included a trial of phentermine HCL (Adipex-P, Jerusalem, Israel), enrollment in structured weight loss programs, medical nutrition therapy for obesity with an RDN, and transitioning away from the use of obesogenic medications. She was most successful at losing weight when enrolled in a structured program like "Weight Watchers."

She previously enjoyed physical activity, including aquatic exercises, physical therapy, chair exercises, and resistance training, but is currently sedentary, stating that life stressors and physical activity limitations due to the coronavirus pandemic, Achilles' tendonitis, osteoarthritis of the knee, and worsening levels of chronic pain have greatly limited her mobility. She was previously counseled on pursuing bariatric surgery as an option but is not interested in having the procedure.

She is enrolled in a Medicare Advantage program, which provides a membership in a health and fitness program that can be followed at home or at a participating fitness center.

## BACKGROUND

Many clinicians are hesitant to advise their older patients with obesity to lose weight because of the concerns and risks that loss of lean body mass would worsen physical function and diminish any benefit gained with weight loss. It is difficult to make an informed clinical decision, as the results from studies are difficult to compare. The studies vary in the ages and types of older adults studied (eg, frail, sedentary, those with osteoarthritis or cardiometabolic disease), the definitions and severity of obesity and sarcopenia, primary outcomes, and the types and duration of interventions.

## Physiologic Adaptations of Aging and Weight

Age-related physiologic adaptations contributing to the accumulation of excess adiposity in the older adult were well described in 2012 by Mathus and the Obesity Management Task Force.<sup>9</sup> Declines in fat-free mass and the integration of fat mass into lean body tissues, such as skeletal muscle and various organs, may result in sarcopenic obesity.<sup>10</sup> Decreased muscle quality and quantity further perpetuate declines in functional capacity and QoL and increase risks for disability, frailty, loss of independence, morbidity, and early mortality.<sup>10</sup>

Other changes, including declines in REE secondary to reductions in physical activity and possibly mitochondrial volume and oxidative capacity, promote greater adiposity in older age and further complicate attempts at weight management.<sup>10</sup>

Furthermore, loss of fat-free mass and declines in metabolic function contribute to many of the medical complications of obesity in the older adult, which include metabolic syndrome (ie, glucose intolerance, HTN, dyslipidemia, and cardiovascular disease), stroke and cognitive impairment, osteoarthritis, pulmonary dysfunction (eg, obesity-related hypoventilation syndrome and obstructive sleep apnea), certain hormone-dependent cancers, sexual dysfunction, ophthalmologic concerns (eg, cataracts and age-related macular degeneration), and urinary incontinence.<sup>10</sup>

## The Obesity Paradox

Despite the many negative health effects of obesity, the metabolic function of adipose tissue may prove beneficial in the older adult. For example, adipose tissue plays a role in stimulating bone growth and inhibiting bone remodeling, which helps preserve bone mineral density (BMD) and lowers the risk of osteoporosis and hip fractures.<sup>9</sup> Conversely, weight loss may be associated with reductions in bone strength and integrity, which may increase frailty and risk of fractures.<sup>18</sup> Furthermore, low body weight in the older adult is linked to increases in mortality, likely owing to the associated loss of muscle mass and strength and dramatic fluid shifts that occur, causing imbalances in water and electrolyte concentrations.<sup>9</sup> This paradox between the pathologic and protective aspects of adipose tissue in older adult populations is largely why weight loss recommendations have been restricted to individuals with clinical obesity and co-occurring health-related issues.<sup>8,18</sup>

## RECOMMENDATIONS FOR PROMOTING SAFE, VOLUNTARY WEIGHT LOSS IN OLDER ADULTS WITH OBESITY

The various risks and benefits associated with weight loss in the older adult greatly complicate recommendations for managing obesity in older populations. Although some published guidelines provide generalized suggestions for approaching weight loss in older adult populations, none of them give specific recommendations for weight management

in older adults.<sup>3-8</sup> In this article, we highlight relevant research findings that may help guide the management of older adults requiring or requesting voluntary weight loss interventions, summarized in Table 1.

*None of the general practice guidelines for the management of obesity give specific recommendations for weight management in older adults.*

As compared with the 2012 EASO guidelines<sup>9</sup> for the treatment of older adults with obesity, the 2022 guidelines place a greater emphasis on treatment individualization. The consensus has been that weight loss should be recommended only in those who have comorbid metabolic, orthopedic, or other weight-related health problems, and only after considering the associated benefits and risks.<sup>1,9,20,21</sup> Even so, weight loss recommendations remain somewhat controversial, and clinicians are left wondering if promoting weight loss among older adults with obesity might do more harm than good.

As noted above, summarizing the evidence is difficult because of the lack of standardized definitions and inconsistencies

TABLE 1 Recommendations for Safe, Voluntary Weight Loss in Older Adults with Obesity
<b>General Guidelines</b>
<ul style="list-style-type: none"><li>• Clinicians should individualize treatment, focusing on wellness, prevention of sarcopenia, and preservation of bone health. Also consider the patient’s motivation, attitudes, cognitive function, social environment, and support system.<sup>17,19</sup></li><li>• Weight loss should be recommended only in those who have co-morbid metabolic, orthopedic, or other weight-related health problems, and only after considering the associated benefits and risks.<sup>1,9,20,21</sup></li><li>• Strategies should minimize loss of bone, muscle, and functional decline.<sup>1,22,23</sup></li><li>• An interprofessional team should carefully monitor any weight loss intervention.<sup>17-20</sup></li></ul>
<b>Energy Restriction</b>
<ul style="list-style-type: none"><li>• Prescribe a moderate energy restriction, combined with resistance training and other physical activity.<sup>1,9,18,24,25</sup></li><li>• Prescribe a caloric restriction that yields a 250–600 calorie deficit (with no less than 1000 calories per day). However, evidence varies.<sup>12,19,22</sup></li><li>• Prescribe an evidence-based high-quality eating approach shown to prevent or manage diet-related chronic disease. Examples include the DASH and Mediterranean diets.<sup>12,26–29</sup></li><li>• Aim for a 5% weight loss over 1 year, at a rate of about 0.25-1 kg per week.<sup>12,22</sup></li><li>• Do not prescribe medications for weight loss as the evidence does not currently support the use of weight loss medications in this age group.<sup>13,17</sup></li></ul>
<b>Nutrient Recommendations</b>
<ul style="list-style-type: none"><li>• Protein: Daily protein intake should be at least 1.0 to 1.4 g/kg body weight.<sup>1,9,10,16,19,23,30–34</sup></li><li>• Leucine: There is evidence of benefit for ensuring adequate dietary intake of leucine.<sup>9,23,33–35</sup></li><li>• Calcium and vitamin D. Dietary intake of 1200 mg calcium and 25 µg (1000 IU) vitamin D is recommended.<sup>29,33,36–38</sup> Supplementation is recommended if dietary intake is insufficient.</li></ul>
<b>Physical Activity Recommendations</b>
<ul style="list-style-type: none"><li>• Prescribe resistance training, critical for the prevention or mitigation of sarcopenia, to increase muscle mass and strength.<sup>32,34,39</sup></li><li>• Prescribe a multicomponent exercise program including strength, resistance, endurance, balance and flexibility, and/or aerobic training to improve and maintain physical function.<sup>9,11,19,20,23–25,32,38–41</sup></li><li>• Incorporate patient desires (improved QoL, climbing stairs, increasing walking distance or strength) when recommending specific training activities.<sup>19,30,38</sup></li></ul>
Abbreviation: QoL, quality of life.

between research trials. In 2020, Goisser and colleagues<sup>19</sup> noted the lack of studies elucidating the risks and benefits of weight reduction in older adults over 70 years, and evidence from a systematic review of randomized controlled trials from 2005-2015 to improve physical function and QoL was of low to moderate quality.<sup>22</sup> Even so, certain interventions consistently show promise in safely managing weight in older adult populations. Notably, the advantages of combining moderate caloric restriction with exercise have become more evident.<sup>20,22</sup> For example, 1 analysis suggested that older adults with obesity can significantly lower cardiometabolic risk by engaging in 12 months of either exercise plus weight maintenance, or exercise plus weight loss through moderate caloric restriction, with no significant changes in total lean mass or total BMD.<sup>26</sup> Nevertheless, questions remain as to the long-term effects of intervention, the most effective dietary composition and level of caloric restriction, and the most effective types and amounts of exercise utilized.<sup>19</sup>

### Dietary Recommendations

Current literature suggests that dietary modifications generating a caloric energy deficit aid in adipose tissue loss. In addition, optimizing protein intake and supplementing calcium, vitamin D, and certain amino acids may mitigate loss of fat-free mass and BMD. Whereas general obesity guidelines recommend a goal of 7% to 10% weight loss from baseline, recent studies demonstrate that a goal of 5% is achievable and beneficial.<sup>11,12</sup>

### Energy Restriction

In the older than in a younger adult, energy deficits from reduced food intake alone are associated with greater proportions of fat-free mass loss in the older adult, predisposing them to frailty, bone mineral loss, and increased risk of fractures. These risks make very low-calorie diets (about 800 calories per day) inappropriate for older adults.<sup>19</sup> Recommendations vary in the amount of caloric restriction that is safe and effective, but a moderate range of 250 to 600 kcal/d below energy needs, while maintaining caloric intake of no less than 1,000 kcal/d,<sup>19</sup> is considered safe. Very-low-calorie diets (about 800 calories per day) are deemed inappropriate for the older person.

### Protein

Science regarding protein requirements for older adult remains controversial, and research is limited. The current recommended dietary allowance is 0.8 g/kg/d,<sup>31</sup> and results of several studies indicate that many do not consume enough daily protein. To slow or prevent muscle protein catabolism, an intake of 1.2 to 1.5 g/kg/d of high-quality protein has been recommended, especially if the individual is exercising or has comorbidities.<sup>9,16,22,23,32-35</sup> There also is evidence suggesting that an intake of 5 to 7 g of leu-

cine per day may augment protein anabolism and discourage protein breakdown.<sup>9,34,35</sup> Older adults with sarcopenia may improve muscle mass with leucine supplementation or increased consumption through many animal-based foods, although the evidence is insufficient to make that recommendation.<sup>30,35</sup>

The specifics of protein quality, timing of ingestion, and other meal components may also play a role in conserving fat-free mass when pursuing weight loss in older adults, but findings remain controversial.<sup>35</sup>

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For example, some researchers suggest that protein intake between 20 and 50 g per meal promotes protein anabolism and prevents weight loss-induced sarcopenia,<sup>22,32</sup> whereas a recent review of the literature on the impact of protein intake during weight loss suggested that a greater intake of protein distributed evenly throughout the day, in combination with resistance training, may improve functional status.<sup>16</sup> In addition, using actual body weight may overestimate protein needs, further complicating recommendations when managing weight in older adult populations with obesity.

### Vitamin D, Calcium, Amino Acid Supplementation

Intake of vitamin D and calcium is frequently insufficient in many populations.<sup>34,42</sup> Supplemental calcium and vitamin D have been shown to minimize the effects of weight loss on bone metabolism, to improve muscle function and proximal weakness in older adults with sarcopenic obesity, and to decrease the risk of falls and fractures.<sup>10,34,36-38</sup> Recommended dosages are those already cited by The US Preventive Services Task Force and the American Geriatrics Society: 25 µg (1000 IU) of vitamin D per day, along with 1200 mg of calcium, in all adults 65 years or older.<sup>10</sup>

Vitamin, mineral, or amino acid supplementation is not a replacement for adequate, high-quality nutrition, but can be used to augment improvements in strength and muscle quality in older individuals pursuing weight loss, while mitigating the potential negative effects associated with declines in fat-free mass.

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### **Dietary Pattern Recommendation**

All studies included in our review suggest that a high-quality diet is important for promoting healthy aging. However, we were unable to find studies focused on safe weight loss in older adults with obesity that recommended a specific diet. Two dietary patterns, the Mediterranean<sup>29</sup> and DASH<sup>42</sup> diets, are healthy eating patterns that emphasize foods rich in protein, fiber, magnesium, and calcium. Many of the recommended dietary components, such as fruits, vegetables, beans, nuts, whole grains, lean meats, fish, and low-fat dairy, have been included in the Dietary Guidelines for Americans as healthy food choices.<sup>42</sup> The Mediterranean Diet has been shown to prevent reductions in muscle mass and BMD and help in the management of chronic diseases,<sup>29</sup> whereas combining the DASH diet with exercise resulted in improvements in weight and blood pressure in older adults with obesity and HTN.<sup>27,28</sup>

### **Physical Activity**

Combining caloric restriction and physical activity can lead to weight loss with increased preservation of lean body mass and may also lead to better physical functioning and improved QoL.<sup>25</sup> In particular, resistance training may prevent muscle loss induced by caloric restriction and has proven beneficial in limiting sarcopenia in older adults pursuing weight loss.<sup>19</sup> It is unlikely that older adults, or those with limited mobility or severe obesity, would be able to exercise with sufficient intensity and duration to achieve weight loss without caloric restriction.

In 2019, researchers performed a head-to-head comparison of aerobic versus resistance exercise, or a combination of both, in older adults restricting calories. They concluded that both resistance exercise alone, or combined aerobic and resistance exercises, can be recommended to protect against bone loss during weight loss therapy of older adults with obesity.<sup>24</sup> The following are 2 examples of exercise prescriptions found to be effective.

The first focused on incorporating resistance exercises 3 times weekly at 1 to 2 sets of 8 to 12 repetitions per exercise, with the goal of advancing to 2 to 3 sets per session, performed at an intensity of 65% to 75% to prevent injury, while also encouraging strength building and increased endurance.<sup>10</sup> Examples of resistance exercises included flexibility exercises, and upper- and lower-body exercises using weight-lifting machines.<sup>10</sup> The second routine included 15 minutes of balance training, 15 minutes of flexibility, 30 minutes of aerobic exercise, and 30 minutes of

high-resistance training over a 90-minute session 3 times a week.<sup>9</sup> Aerobic exercises included those performed at moderate intensity utilizing a treadmill or elliptical, while resistance exercises included those performed to volitional fatigue on weight machine such as leg press, latissimus pulldown, and bicep curl.<sup>9</sup>

Importantly, incorporation of physical activity should be sustainable. Many effective regimens take months to see improvements in muscle quality and physical function. Gielen and colleagues found that progressive resistance training of at least 24 weeks, in combination with protein supplementation, achieves optimal effects on muscle mass and strength in older adults, particularly those with obesity.<sup>23</sup> Achievable, effective exercise interventions are best utilized when they are individualized to the physical limitations of the patient and modified as the patient's mobility varies throughout the intervention.

Fanning and colleagues<sup>25</sup> note the importance of identifying the patient's goals or motivation, such as overall mobility, stair climbing self-efficacy, or improvements in strength, flexibility, or satisfaction with physical function, when prescribing aerobic and/or resistant exercise. For more information on optimizing exercise and physical activity for weight management in older adults with obesity, please refer to the 2021 International Exercise Recommendations in Older Adults, which were proposed to bridge the gaps in the current literature.<sup>40</sup>

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### **Considerations for Bone Health**

Despite the benefits of weight loss and increased physical activity in the older adult, the potential for bone mineral loss cannot be ignored. Weight loss significantly reduces BMD in the older adult, increasing the risk for osteoporosis, frailty, and fractures. Short-term weight loss of 3 to 6 months is associated with both total and regional reductions in BMD, especially in the hip and femoral neck.<sup>39</sup> These effects are especially pronounced when individuals are performing aerobic exercise as their only physical activity.<sup>24</sup>

However, caloric restriction combined with a multicomponent physical activity regimen may help mitigate the loss of BMD associated with caloric restriction or aerobic exercise alone.

A study of 65-year-old participants by Yarizadeh and colleagues<sup>39</sup> found that caloric restriction, in conjunction with combined exercise training, for more than 200 days significantly improved BMD of the hip and femoral neck. This study highlights the importance of incorporating physical activity into weight management strategies, to conserve bone strength in older adults with obesity. Further investigation into how various exercise modalities affect BMD at different sites is needed.<sup>41</sup>

Other studies report similar findings: when compared to aerobic exercise alone, resistance and combined aerobic and resistance exercises are associated with less weight loss–induced reductions in BMD of the hip, as well as reduced intensity of bone turnover.<sup>23</sup> Thus, both resistance and combined aerobic and resistance exercises can be recommended to protect against reductions in BMD for older adults with obesity who are pursuing weight loss.<sup>23</sup>

### Intensive Behavioral Therapy for Obesity

In 2011, Intensive Behavioral Therapy for Obesity (IBTO) was initiated by The Centers for Medicare and Medicaid Services to provide Medicare beneficiaries with brief, scheduled, individual counseling sessions.<sup>43</sup> The Centers for Medicare and Medicaid Services offers general recommendations for delivering the program, which includes screening for obesity, a dietary or nutritional assessment, and intensive behavioral counseling and therapy using the 5-A structure.<sup>43</sup>

An IBTO protocol developed by Wadden<sup>44</sup> includes a total of 21 visits over 1 year, which are delivered weekly from weeks 1 to 4, and then every other week from weeks 6 to 24. Visits are then provided monthly for the remainder of the year. This protocol has a guide for the clinician, handouts for the participants, and weekly skill building assignments for each visit. Participants record their daily food and calorie intake using an available phone or computer app, to be reviewed with the clinician at the next visit. Physical activity and body weight also are monitored.

The efficacy of this evidence-based treatment protocol was recently assessed in a clinical trial and was found both safe and effective.<sup>44</sup> In this clinical trial, the 50 participants with obesity assigned to a specific IBTO protocol lost a mean of 5.4% of their initial bodyweight at week 24, with 46% of participants losing 5% or more of their baseline weight. At 1 year, the mean loss was 6.1%, and 44% of participants lost 5% or more, supporting both the effectiveness and sustainability of IBTO in aiding older adults with weight management.

## CASE REVISITED

Review of the literature suggests that a combination of moderate calorie reduction and increased protein intake, along with regular resistance exercise, would give Ms PC

the best chance of safely achieving and maintaining a 5% weight loss. Such changes would also promote a favorable shift in body composition, with co-occurring improvements in strength, flexibility, and overall mobility.<sup>9,38,44</sup> Use of dietary supplements to meet the recommended intake of calcium and vitamin D may be necessary.

### The Individualized Plan for Ms PC

Ms PC and her interprofessional team agreed that weight loss of 5% would greatly benefit many of her chronic health conditions, reduce her medication use, and improve her QoL. Her REE measured at 1899 calories per day. Given that Ms PC was sedentary and reported limited physical activity, her medical team decided to use a 1.1 to 1.2 physical activity factor, subtracted a calorie deficit of 500 calories per day, and agreed on a calorie goal of 1600 per day.

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Ms PC's 5-day diet diary was analyzed using the ESHA Food Processor. Table 2 includes foods, calories, and nutrients she consumed on a typical day. Nutrients of concern included folate, vitamin D, calcium, magnesium, and potassium.

Based on this information, advice on achieving a daily caloric intake of 1600 calories per day was provided, with a recommended eating structure of 3-meals-per-day with 1 evening snack and protein intake spread throughout the day. Table 3 describes the basic number of servings and food choices calculated to create her meal pattern. Table 2 shows a sample day. Ms PC was cautioned by the RDN that she may need to further divide her nutrition into smaller meals and snacks, given her history with delayed gastric emptying, and that she should monitor her symptoms accordingly.

Given the severity of her obesity, we used an adjusted weight as described by Hamdy and coworkers,<sup>45</sup> calculated at 186 lb (84.37 kg), to individualize her recommendations. She was advised to consume 102 g of protein daily, in accordance with a 1.2 g/kg/d recommendation. Although Ms PC preferred to consume most of her protein in 1 meal, she agreed to spread it throughout the day to help increase her total daily intake and ameliorate discomfort that could be caused by her delayed gastric emptying.

TABLE 2 Single-Day Comparison of Typical Dietary Intake vs. Recommended Nutritional Intervention				
Meal	Typical Dietary Intake Before Counseling		Recommended Dietary Changes to Meet Goals	
	Item	How Much	Item	How Much
Breakfast	–Orange, fresh	1 medium	–Whole wheat bread	1 slice, toasted
	–Cereal, CHERRIOS	2 cups	–Scrambled egg white	Cooked in 1 tsp olive oil
	–KIND bar	1 serving	–Fresh ham, lean	1 oz
			–Swiss cheese	1 slice, melted
			–Banana	1 medium
			–Vegetable juice	½ cup
			–Yogurt, vanilla (fat-free, no sugar added)	1 cup
Lunch	–Apple	1 medium	–Whole wheat bun	1 toasted
	–Subway 6-in turkey, bacon, cheese sub	1 each	–Chicken breast	3 oz grilled boneless
	–Chips, multigrain, French onion	1 single-serve bag	–Mixed green salad (kale, spinach)	2 cups, chopped
			–Cherry tomatoes	½ cup
			–Raisins	2 tbsp
			–Pumpkin seeds	2 tbsp
			–Balsamic vinaigrette	1 tbsp
Dinner	–Chicken parmesan	1 entrée	–Sirloin steak	3 oz grilled
	–Greek chicken salad	1 serving	–Baked potato	3 oz baked
	–Ice cream sandwich	1 serving	–Butter	1 tbsp
			–Black bean salad with vinaigrette dressing	½ cup
			–Broccoli florets	1 cup, steamed
			–Orange	1 medium
	Not typically consumed		–Yogurt, vanilla, fat-free no sugar added	1 cup
Snack			–Strawberries	1 cup, fresh
			–Almonds	100-calorie pack

(continues)

**TABLE 2** Single-Day Comparison of Typical Dietary Intake vs. Recommended Nutritional Intervention, Continued

Nutritional Analysis for Intake Before Counseling						Nutritional Analysis for Suggested Intake					
Total	Cals (kcal)	Carbs (g)	Added Sugar (g)	Fiber (g)	Protein (g)	Total	Cals (kcal)	Carbs (g)	Added Sugar (g)	Fiber (g)	Protein (g)
	2,053	231 (45%)	22	20	99 (20%)		1,630	186 (46%)	12	22	110 (27%)
Fat (g)	Calcium (mg)	Vitamin D (μg)	Potassium (mg)	Sat. Fat (g)	Leucine (g)	Fat (g)	Calcium (mg)	Vitamin D (μg)	Potassium (mg)	Sat. Fat (g)	Leucine (g)
79 (35%)	517	2.11	1,925	25 (11%)	1.24	55 (30%)	979	1.48	4,063.38	16.61 (9%)	8.4

She was counseled on choosing leaner protein sources like poultry and fish, as well as plant-based options to help improve her cholesterol, decrease her saturated fat intake, and increase her daily consumption of leucine. Ms PC was educated on the potential benefit of increasing leucine in her diet. The RDN reviewed a list of leucine-rich foods published by the US Department of Agriculture,<sup>30</sup> from which she could choose. After a discussion of different evidenced-based eating plans, Ms PC, agreed to follow the DASH eating pattern.<sup>42</sup> Some modifications were made to ensure consuming adequate intake of leucine in a dietary pattern she could sustain over time.

It also was determined that she would benefit from supplemental calcium (250 mg/d) and vitamin D (25 μg), to augment the amount planned from food. With careful diet selection, Ms PC would approach meeting her daily need for magnesium, potassium, and folate, but a daily multivitamin-mineral supplement was considered a reasonable addition while restricting her caloric intake.

For physical activity, Ms PC had previously expressed interest in going to the local Physical Medicine and Rehabilitation Therapy Pool for aquatic exercise. Not only would this provide her with structure and support around safe and healthy movement, but also the low-impact, resistance environment of water-based exercise would help increase her strength and endurance without causing deleterious effects on her joints. Ms PC was agreeable to starting out with 2–3 aquatic exercise sessions per week to ease into more regular physical activity. She expressed interest in learning chair exercises, and ways to be accountable for setting aside time to prioritize her health. Finally, she was also referred to physical therapy for guidance on how to integrate more balance, resistance, and strength-based exercises into her daily routine.

Although these recommendations would likely benefit Ms PC, her ability to maintain these changes will be vital in promoting long-term health benefits. Regular check-ins with members of her interprofessional team would provide necessary structure and support for sustaining these changes, but the cost associated with multiple office visits may serve

**TABLE 3** Pattern to Build a Meal Plan for Ms PC

No. Servings	Food Choice	CHO, g	Pro, g	Fat, g	kcal
5	Starch	75	15	5	400
4	Fruit	60	0	0	240
2	Dairy (fat free)	24	16	0	180
4	Nonstarchy veg	20	8	0	100
4	Meat (lean)	0	28	12	220
5	Meat (med fat)	0	35	25	375
3	Fat	0	0	15	135
	Total	179 (43%)	102 (25%)	57 (31%)	1650

Abbreviations: CHO, Carbohydrate; Pro, proteins.

as a barrier to continuation of care. She will talk with her family physician about accessing Medicare's IBTO services.

## SUMMARY

Ms PC's medical history and continued struggles with weight loss highlight the unique nuances involved with weight management in older adults. There is currently insufficient literature to identify the most effective dietary pattern, level of caloric restriction, and types and amounts of physical activity needed to treat obesity-related health problems in older adults, while sparing lean tissue and bone mass to preserve strength and independence. This is especially true for those older than 70 years and those unwilling or unable to exercise. In the meantime, individualizing diet, integrating dietary supplements and physical activity plans as needed, and providing continued support are important for encouraging patients to prioritize their health and safely pursue positive lifestyle changes.

Effective weight loss strategies should be considered in older adults. Although there are potential risks, utilizing practical clinical approaches can minimize potential harms and maximize the benefits of improved weight management in older adults with obesity.

Appropriate dietary modifications can foster improvements in physical function, QoL, cardiovascular and metabolic parameters, and other obesity-related comorbidities. In addition, multimodal exercise interventions help promote improvements in muscle quality and strength, flexibility, and endurance, while reducing risk of falls and frailty. Physical activity regimens incorporating both resistance and aerobic exercises optimize fat mass loss, while preserving lean body mass and maintaining beneficial weight changes.

Implementing both dietary and multicomponent exercise interventions helps maximize fat mass loss, while attenuating loss of muscle and bone in older adults pursuing weight loss. This combined approach also improves physiological functioning, mobility, and overall body composition.

It is important to note that many of the studies referenced in this article utilized patient populations with BMIs of 30 to 39 kg/m<sup>2</sup>, making it difficult to conclude that these recommendations are sufficient for patients with greater body mass. Such patients may present with additional challenges that warrant cautious consideration when pursuing weight management strategies.

Additionally, whereas many of the studies included participants 65 years and older, we also referenced a study and guidelines for adults older than 70 years. Although there may be differences between chronological and biological age, the presence of obesity and other metabolic derangements, such as diabetes mellitus, are known to accelerate vascular aging.<sup>46</sup> This effect is associated with a shortened life span in mammalian species, potentially in part because of chronic inflammation.<sup>46</sup> The nuance between the effects

of chronological and biological aging makes it difficult, at this time, to precisely define an "older adult."

Nevertheless, all older adults with obesity pursuing weight loss interventions require careful monitoring by medical professionals to treat and prevent the development of maladaptive physiologic changes, such as sarcopenic obesity, decreases in BMD, nutrient deficiencies, and exacerbation of cognitive impairment. With proper management and maintenance of both dietary and exercise-based interventions, weight loss can be achieved both safely and sustainably in older adults with obesity.

## Acknowledgment

We acknowledge Jamie Bloss, MLIS, AHIP, Liaison Librarian, Allied Health Sciences and Dental Medicine, Laupus Health Sciences Library, East Carolina University, for her assistance with the review of the literature and the patient who cooperated with our work.

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