CME CREDIT *EDUCATIONAL OBJECTIVE:* Readers will identify factors that complicate the assessment and treatment of obesity in older patients

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Obesity in the elderly: More complicated than you think

ABSTRACT

The number of obese older adults is on the rise, although we lack a proper definition of obesity in this age group. The ambiguity is primarily related to sarcopenia, the progressive loss of muscle and gain in fat that come with aging. Whether to treat and how to treat obesity in the elderly is controversial because of a paucity of established guidelines, but also because of the obesity paradox—ie, the apparently protective effect of obesity in this age group.

KEY POINTS

In older patients, the waist circumference may be more appropriate than the body mass index as a measure of adiposity.

Data suggest that being moderately overweight may offer a survival advantage in older people, but a body mass index of 30 kg/m^2 or higher continues to be associated with many health risks in this age group.

In obese patients, intensive lifestyle interventions with an emphasis on exercise and strength training can optimize their overall health and quality of life.

Weight-loss recommendations in older obese patients should take into account the benefits and risks of lifestyle interventions, drug therapy, and bariatric surgery.

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Should older obese people try to lose weight? Such a simple question is more complicated than one would think.

At issue is whether obesity is harmful in older people, and whether treating it will reduce their health risks. True, obesity is an independent risk factor for cardiovascular disease and is associated with many comorbidities, including type 2 diabetes mellitus, hyperlipidemia, heart failure, and hypertension.[1] An independent association also exists between obesity and all-cause mortality.[2] However, there is also evidence suggesting that obesity in this age group is associated with a lower, not higher, risk of death—a finding termed the obesity paradox.[3] And for that matter, what exactly constitutes obesity in elderly people, who naturally undergo changes in body composition as they age?

This article examines the literature on these controversial issues, including changes in body composition with age, the definition of obesity in older adults, the obesity paradox, and treatment of obesity in older adults.

AMERICANS ARE GETTING OLDER—AND BIGGER

Americans are living longer than ever before; life expectancy has reached a new high of 77.8 years.[4,5] According to the US Census Bureau,[6] about 27 million people in the United States are over age 70, and this number is expected to nearly double by 2030.

Meanwhile, the prevalence of obesity, defined as a body mass index (BMI) of 30 kg/m^2 or higher, has increased in the last 25 years in all age groups in the United States, including those age 65 and older.[7,8] These two trends add

Drugs mentioned in this article

Gabapentin (Neurontin)

Olanzapine (Zyprexa)

Orlistat (Xenical)

up to an increase in the number of obese older people. In 2000, 22.9% of people age 60 to 69 and 15.5% of those over age 70 and older were obese.[9] This amounted to a 56% increase in the former group and a 36% increase in the latter group in the interval since 1991.[5,9]

BUT WHAT CONSTITUTES 'OBESITY'?

Obesity is the excess accumulation of body fat, leading to a higher risk of medical illness and premature death. But measuring it is not as simple as one might think.

The body mass index can mislead

The BMI, ie, weight in kilograms divided by the square of the height in meters, correlates fairly well with body fat stores and is generally used to classify medical risk.

In older people, having too much visceral fat is more prevalent than the BMI might predict

However, the BMI can classify some older people as overweight (BMI 30.0–34.9 kg/m^2) or obese (BMI ≥ 35.0 kg/m^2) who actually do not have an excess of body fat—and can fail to classify others as overweight or obese who do. For example, if a person loses height as a result of vertebral compression fractures, his or her BMI would become higher, even with no change in weight or body fat. Conversely, changes in body composition with age, including loss of muscle and an increase in fat, may not be reflected in the BMI, even if the person really does have too much body fat.[10]

This second limitation of the BMI is important when estimating risk in older adults, who have a particular fat distribution. Visceral, subcutaneous, intramuscular, and intrahepatic fat increase with age, and they are all risk factors for insulin resistance and type 2 diabetes mellitus.[11] And in older people, having too much visceral fat is more prevalent than the BMI might predict.[10]

Percent body fat awaits investigation

Percent body fat is another way to assess body fat. Defined as the total weight of fat divided by total weight, it is measured in various ways.

Dual-energy x-ray absorptiometry, computed tomography, and magnetic resonance imaging can measure percent body fat, and they can differentiate visceral from subcutaneous fat (which is less metabolically active). Unfortunately, most of these tests are used for this purpose only in research, and they are relatively expensive.

Commercially available bioelectrical impedance devices send a weak electric current through the body and measure the resistance, and using this information and four other factors (height, weight, age, and sex), they calculate percent body fat. This method is fast, easy, painless, and cheap. A disadvantage is that the handheld devices measure body composition of the upper body only. Because the lower body is excluded, they do not give an accurate measurement of body fat of the abdomen and hips. Also, they cannot differentiate visceral from subcutaneous fat.

Bioelectrical impedance devices work well in healthy individuals with stable water balance. The values are only an estimate of fat-free mass, and therefore this method is not the gold standard for assessing body fat. Bioelectrical impedance is better at tracking body composition in an individual over time than at diagnosing obesity.

Percent body fat can vary by sex and race. Asians, for example, have higher percent body fats at lower BMIs, particularly when younger.[12] Also, Gallagher et al[12] found that percent body fat increased with age at every given BMI in both men and women (TABLE 1).

The traditional universal cutoffs for defining obesity by percent body fat are 25% in men and 35% in women. However, research has indicated that cutoffs of 20% to 25% in men and 30% to 38% in women may better identify those at risk of metabolic disease.[13] Guidelines and evidence-based cutoffs for percent body fat must await further investigation.

Waist circumference is useful

In older adults, obesity can be diagnosed by a measurement such as waist circumference, which correlates highly with total fat and intra-abdominal fat.[14] It is very cost-effective, simple, and useful for the office assessment of adiposity.

The measurement should be made halfway between the iliac crest and the lower anterior ribs, with the patient standing, and at the end of expiration.

The traditional standard for waist circumference is less than 89 cm (35 inches) for women and 102 cm (40 inches) for men. However, opinion differs, and different reference ranges exist depending on ethnicity. Additionally, because stature and body composition change with age, concerns have been raised about misclassification of the health risks related to obesity in older adults using the current standard.[15,16]

The waist circumference is as good as or even better than the BMI as a measure of excess adiposity in older adults.[16–18] This is in part because of the age-dependent height decrease in older adults.[15,19] (Recall that the BMI is calculated using the height squared as the denominator; as a result, the BMI would give a higher reading and thus an overestimate of total body fat.) Conversely, we can underestimate the amount of adiposity because of decreases in abdominal muscle tone.[17]

Cutoffs for waist circumference should be age-specific.[16]

Investigators in the Netherlands[15,16] prospectively took 4,996 measurements in 2,232 people with a mean age of 70, from 1992 through 2006. They concluded that the best cutoffs for predicting the health risks of obesity in the elderly were 109 cm (43 inches) in men and 98 cm (39 inches) in women.

A group of researchers has proposed that the cutoffs be shifted upward in older adults, with new values for those age 70 and over.[20] The Health Survey for England aimed to describe the patterns and trends in waist circumference and abdominal obesity and overweight in people age 70 through 89, comparing both the standard and the new cutoffs. Optimal cutoffs recommended for abdominal obesity for patients age 70 and older were 100 to 106 cm in men and 99 cm in women.[20] Estimates of the prevalence of abdominal obesity are much lower using the new cutoffs.

TABLE 1

At any body mass index (BMI), percent body fat increases with age [a]

Sex and BMI	Percent body fat		
	Age 20–39	Age 40–59	Age 60–79
Women			
BMI < 18.5	21	23	24
BMI ≥ 25	33	34	36
BMI ≥ 30	39	40	42
Men			
BMI < 18.5	8	11	13
BMI ≥ 25	20	22	25
BMI ≥ 30	25	28	30

[a] BMI values are in kilograms of weight per meter of height squared (kg/m^2). Values shown are for African Americans and whites.

REPRINTED FROM GALLAGHER D, HEYMSFIELD SB, HEO M, JEBB SA, MURGATROYD PR, SAKAMOTO Y. HEALTHY PERCENTAGE BODY FAT RANGES: AN APPROACH FOR DEVELOPING GUIDELINES BASED ON BODY MASS INDEX. AM J CLIN NUTR 2000; 72:694–701. AMERICAN SOCIETY FOR NUTRITION.

SARCOPENIA: LOSS OF MUSCLE WITH AGE

With age comes sarcopenia—the progressive loss of muscle mass, primarily skeletal muscle, resulting in a decrease in strength and power.[21] The process begins as early as the 20s or 30s.[22] It is distinct from wasting (involuntary weight loss from inadequate intake), seen in starvation.[21]

Sarcopenia is defined as an appendicular skeletal muscle mass index (the appendicular skeletal mass divided by the square of the height in meters) of less than 2 standard deviations below a young adult reference, and a percentage of body fat over the 60th percentile for the individual's sex and age.[23,24] Estimates of its prevalence vary, but it is common and it increases with age.[14,20]

Measure the waist halfway between the iliac crest and the lower anterior ribs, with the patient standing, and at the end of expiration

Sarcopenic obesity: Less muscle, more fat

Progressive loss of skeletal muscle with age, along with an increase and redistribution of body fat, is known as sarcopenic obesity.[25] It is associated with higher morbidity and mortality rates as well as a decline in functional strength, which leads to frailty.[23] This loss of muscle mass may go unnoticed in an older person until he or she begins to lose physical function.

As noted, in an older person with sarcopenic obesity, the BMI may mislead because of the high percentage of fat and the low lean mass.[26]

Why we change with age

This change in body composition with age is a result of several factors. Illness or inactivity can lead to loss of muscle, while body fat is preserved.[17] The combination of reduced physical activity, a lower resting metabolic rate, and an unchanged intake of food can increase the likelihood of sarcopenia.[27] Also possibly contributing are hormonal changes, including reduced production of growth hormone and testosterone and decreased responsiveness to thyroid hormone and leptin.[28]

Moreover, the interaction of several factors can lead to a vicious circle of progressive loss of muscle and increase in fat. As people age, their physical activity tends to decrease, resulting in muscle loss. As muscle mass decreases, the amount of available insulin-responsive tissue is reduced, resulting in insulin resistance, which in turn promotes the metabolic syndrome and an increase in fat. With more fat, people produce more of the adipokines tumor necrosis factor alpha and interleukin 6, which further promote insulin resistance.

Other changes contribute to a decrease in muscle quality and performance, including an increase in intramuscular and intrahepatic fat, which is associated with insulin resistance.[11] The increases in adipose stores occur mostly in intra-abdominal fat rather than in subcutaneous fat.

Loss of muscle may go unnoticed in an older person until he or she begins to lose physical function

ADVERSE EFFECTS OF OBESITY

A number of comorbidities arise with obesity, regardless of age.[19]

The diseases most strongly associated with obesity are the metabolic syndrome and type 2 diabetes mellitus.[17] Studies have shown that in older adults, obesity as measured by waist circumference is associated with hyperglycemia and dyslipidemia.[29,30]

Metabolic abnormalities may ensue in obese older people through complex mechanisms involving an age-related decline in sex hormones. For example, late-onset hypogonadism in men, which is more common in those who are obese, is related to the metabolic syndrome.[29]

These mechanisms are also complex in women. Because estrogens can be produced in adipose tissue, obese postmenopausal women have higher concentrations of estrogens than their lean counterparts, and this may lead to metabolic abnormalities.[31] (On the other hand, higher estrogen levels in obese menopausal women can protect against osteoporosis by increasing bone mass.)

Older people who weigh more and have more adipose tissue, especially those who became obese at a young age, have a greater risk of osteoarthritis of the knee,[32,33] which when combined with obesity can cause disability and physical impairment.[19] And cardiovascular risk factors,[18,33] hypertension,[34] and certain cancers[35] are more common in older people with higher waist circumference.

THE OBESITY PARADOX

In general, obesity in younger adults has been shown to shorten life expectancy. This risk of death is often associated with obesity-related health problems.

In older people, the effect of obesity is much more complex.[36] The optimal weight in terms of survival increases with age. More interesting is the finding that although the risk of cardiovascular disease is higher in overweight or obese older adults, studies also suggest that in this age group, being overweight or obese is paradoxically associated with lower mortality rates from these diseases.[26] This phenomenon is called the obesity paradox.[37]

For those over age 75, the relative risk of death from all causes and from cardiovascular disease has been found to decrease with increasing BMI.[25] The relationship between BMI and death from all causes in older adults may actually be a U-shaped curve, meaning that the risk of death rises at both extremes of BMI values.[26]

Possible explanations for the paradox

Several hypotheses have been proposed to explain the change in the relationship between BMI and the risk of death that occurs with aging.

The BMI is an imperfect measure of obesity. The obesity paradox may be an artifact of using the BMI to measure obesity in older adults.[17] As described above, sarcopenic obesity must be considered in those over age 65 because the BMI does not differentiate between fat and muscle. Older adults tend to have a higher proportion of body and visceral fat that is distributed differently, making the waist circumference or waist-hip ratio a more appropriate measure of obesity in this group.[38] Janssen et al[39] found that in people age 65 and older, after controlling for waist circumference, higher BMI values were associated with lower death rates; after controlling for BMI, waist circumference was associated with a higher risk of death.

The survival effect suggests that people who are susceptible to the negative effects of obesity die sooner,[40] and those who survive until old age may be resistant to the effects of obesity.[41] If true, the survival effect would explain why the death rate seems to be unaffected by BMI in the older population.

Unhealthy weight loss. Smoking and diseases such as cancer that can cause early death may also induce weight loss, further complicating the relationship between BMI and death.[19] After age 80, the association between BMI and the risk of death is weak because those with a low BMI include not only those who have always been lean and physically active, but also those who lost weight through chronic ill health or smoking.[17]

Further study needed. Thus, a number of confounding variables may muddy the association between obesity and death in older adults. Obesity should not be misinterpreted as being harmless or beneficial in older adults. Stevens et al[36] found that a greater BMI was associated with a higher rate of death from all causes and from cardiovascular disease in men and women up to age 75, but that the relative risk of death associated with a greater BMI decreased with age.

Optimal BMI targets in older people have yet to be validated in a large prospective trial. However, multiple studies have examined the relationship between BMI and all-cause mortality in older adults and have identified a BMI of 24 to 35 as "ideal" and associated with the lowest risk of death, with a lower range for men and a higher range for women.[42,43] The topic has been reviewed by Oreopoulos et al.[26] More research is needed to evaluate this relationship.

THE BENEFIT OF WEIGHT LOSS IN OLDER ADULTS IS CONTROVERSIAL

In younger obese people, weight loss brings a multitude of benefits by reducing the risk of complications arising from obesity. However, in older adults, the effects of weight loss remain controversial, and evidence to guide treatment is limited.[44,45] The few trials that have been published have typically focused on cardiovascular risk factors rather than physical function.[45]

In a 1-year trial, 107 people age 65 or older were randomized to a control group, to weight management, to exercise, or to weight management plus exercise. The combination of weight loss and exercise yielded the greatest improvement in physical function.[46]

Intentional vs unintentional weight loss

Intentional weight loss is altogether different from unintentional weight loss.

In most cases, weight loss in older adults is unintentional and may indicate underlying disease and impending death.[17] For example, older men who lose weight unintentionally have significantly greater rates of smoking, disability, cancer, and respiratory disease and less obesity and physical activity than those who lose weight intentionally.[47]

Several factors can lead to a vicious circle of progressive loss of muscle and increase in fat

Studies have shown an increase in life expectancy in older patients with type 2 diabetes mellitus who lost weight intentionally.[48,49] In fact, moderate weight loss—just 5% to 10%—has been shown to improve cardiovascular risk factors,[44] osteoarthritis, and type 2 diabetes.[50]

Bales and Buhr[44] performed a systematic review of 16 studies that had lasted at least 6 months. Patients were age 60 or older with a minimum baseline BMI of 27 kg/m^2 who intentionally lost at least 3% of body weight or 2 kg. Levels of the inflammatory markers C-reactive protein, tumor necrosis factor alpha, and interleukin 6 declined with weight, along with blood pressure, fasting glucose, waist circumference, and low-density lipoprotein cholesterol. On the downside, bone mineral density and lean body mass also declined slightly.

TABLE 2

In the elderly, is obesity bad? Is losing weight good?

Clinical outcome	High body mass index	High abdominal fat	Increased lean muscle	Intentional weight loss
All-cause mortality	Decrease or neutral	Increase	Decrease	Unknown
Cardiovascular mortality	Decrease or neutral	Increase or neutral	Unknown	Unknown
Cardiovascular morbidity[a]	Increase	Increase	Neutral	Decrease
Cancer incidence	Increase	Increase	Decrease or neutral	Unknown
Diabetes mellitus and insulin insensitivity	Increase	Increase	Neutral	Decrease
Blood pressure	Increase	Increase	Unknown	Decrease
Physical function	Decrease but higher than normal	Decrease	Increase	Increase
Quality of life	Decrease	Decrease	Increase	Increase
Cognitive function	Increase or neutral[b]	Increase or neutral[b]	Unknown	Unknown
Long-term medication use	Increase	Increase	Unknown	Potential decrease for antihypertensive drugs
Bone mineral density	Increase	Increase	Increase	Slight decrease
Dyslipidema	Increase	Increase	Unknown	Decrease

[a] Myocardial infarction or stroke.
[b] May be different for women.

REPRINTED FROM OREOPOULOS A, KALANTAR-ZADEH K, SHARMA AM, FONAROW GC. THE OBESITY PARADOX IN THE ELDERLY: POTENTIAL MECHANISMS AND CLINICAL IMPLICATIONS. CLIN GERIATR MED 2009; 25:643–659, WITH PERMISSION FROM ELSEVIER. HTTP://WWW.GERIATRIC.THECLINICS.COM.

The best way to avoid loss of lean mass and to preserve bone density is to combine weight loss interventions with resistance training

The best way to avoid losing lean body mass and to preserve bone density during weight loss is to include a program of resistance-training exercises.

No clinical trial has evaluated the effects of intentional weight loss on death rates in older obese people.[25] As a result, evidence-based recommendations cannot be made. Rather, advice on weight loss must be individualized, with special emphasis on the patient's weight history and medical comorbidities.[44]

Oreopoulos et al[26] summarized the possible effects of BMI, abdominal fat, lean body mass, and intentional weight loss on morbidity and mortality outcomes in older adults (TABLE 2).

TREATMENT GUIDELINES AND RECOMMENDATIONS

Many of the methods of weight management in older adults are the same as in young and middle-aged adults.[51] Recommendations for all age groups include lifestyle changes, increased activity, dietary changes, drug therapy,

and bariatric surgery.

Whether there should be separate guidelines for older adults is controversial. In view of the obesity paradox, physicians have been reluctant to recommend weight loss in elderly patients. Caution is advised in recommending weight loss solely on the basis of body weight, as studies have shown that the weight associated with maximal survival increases with age. Because of age-related changes in body composition and reduced energy requirements and expenditure, recommendations for the young and middle-aged should not be applied directly to older adults.

In this group, especially those who have survived into old age with good health and an intact functional status, one could argue that significant caloric restriction should not be recommended. In these people, the goal is often to maintain weight and incorporate a daily exercise program rather than to aggressively lose weight. Adding resistance training can improve physical function, which can improve quality of life. There is less emphasis on cardiovascular risk, but both outcomes apply for both age groups.[52]

Intentional weight loss should be recommended to high-risk older adults, including those with cardiovascular disease, type 2 diabetes mellitus, and metabolic syndrome, because the absolute risk of death and morbidity is higher in this group. Most health benefits can be achieved with modest weight loss.[53] Potential benefits include prevention of cognitive impairment, protection from bone fractures, an increase in antioxidant defense, a reserve of fat and energy stores, and an increase in longevity.[26]

Treatment differs from that in the younger population primarily because of the importance of preventing loss of muscle with intentional weight loss. People of all ages who lose weight intentionally lose fat and, to a lesser extent, skeletal muscle. Older patients have already lost muscle mass, but further changes in body composition, especially a further reduction in muscle mass, can be limited by consuming about 1.0 g/kg of high-quality protein in the diet and by engaging in resistance training and weight training.[52]

Improving quality of life and physical function are important goals. Information is emerging about when obesity needs to be managed in older adults. There is also evidence to support dietary and exercise therapy.[54] Weight-loss options include lifestyle interventions, pharmacotherapy, and bariatric surgery.

Lifestyle interventions: Diet and exercise

The goal is to induce an energy deficit by reducing energy intake, increasing energy expenditure, or both—by 500 to 1,000 calories a day. This generally leads to a loss of 1 to 2 lb per week, and possibly up to 10% of weight in 6 months. Loss of about 10 to 20 lb with diet and exercise can translate to a relatively large reduction in visceral fat, with subsequent improvement in metabolic abnormalities.

A regular exercise program is important for improving overall physical function, which can slow progression to frailty. Adding aerobic, endurance, and resistance training helps preserve fat-free mass, which otherwise tends to diminish during active weight loss.[55–57]

The exercise program should begin at the outset of the weight-loss effort to help maintain weight loss and to prevent weight regain.[58] Exercise is not essential for reaching the targeted weight loss, but starting early is important to reduce the loss of lean muscle that is usually already seen in the older population.

In view of the obesity paradox, physicians have been reluctant to recommend weight loss to older adults

Several studies indicate that diet and exercise are just as effective in middle-aged and older people (over age 60) as in the younger population.[58–60] Older people in the Diabetes Prevention Program were more compliant with lifestyle interventions and lost more weight than younger participants[49]: 60% of the older group met the 7% weight-loss goal at the end of 24 weeks, compared with 43% of those under age 45. At 3 years, the numbers were 63% vs 27%.

In a small randomized controlled trial,[61] fat mass decreased by 6.6 kg in 17 people assigned to a program of diet and exercise, compared with a gain of 1.7 kg in a control group of 10 patients. Fat-free mass decreased by about 1 kg in both groups. The authors concluded that diet plus exercise (resistance training and strength training in this trial) could ameliorate frailty in obese older adults.

If exercise is appropriate, a physician should write a prescription for it, especially for resistance training, strengthening, flexibility,

and stretching. This is important for patients with sarcopenic obesity and for those at high risk of chronic bone loss. The 2007 American College of Sports Medicine guidelines recommend muscle-strengthening activity of 8 to 10 exercises involving the major muscle groups, 10 to 15 repetitions at least twice a week. Flexibility and balance exercises should be included for those at risk of falls.[62]

Pharmacotherapy

At present, there are two general classes of weight-loss drugs: appetite suppressants and drugs that interfere with nutrient absorption.

Appetite suppressants include the sympathomimetics, which stimulate the release of dopamine and norepinephrine, resulting in increased satiety. Data—and therefore, recommendations—on their use in the elderly are very scarce, as most randomized controlled trials included only a small number of older people. A meta-analysis of drug therapy to treat obesity noted that the study population ranged in age from 34 to 54.[63]

The only approved drug currently available for use in older adults is orlistat, which blocks absorption of dietary fat by binding to intestinal lipase. A randomized controlled trial found the weight loss with orlistat to be comparable in older and younger adults.[64,65]

Improving quality of life and physical function are important goals of treatment

Review medications than can cause weight gain

When assessing older adults, always review the drugs they are taking. Those known to cause weight gain include certain of the following:

- Antiepileptics (eg, gabapentin)
- Antipsychotics (eg, olanzapine)
- Antidepressants (eg, tricyclics)
- Antihyperglycemic drugs (eg, sulfonylureas, thiazolidinediones)
- Beta-blockers
- Steroids.

If medically appropriate, a weight-neutral drug should be substituted for one suspected of causing weight gain. If a different physician (eg, a specialist) prescribed the original drug, he or she should be notified or consulted about any change.

Bariatric surgery

Bariatric surgery is the most effective weight-loss option, and more older patients are undergoing it than in the past. Dorman et al[66] showed that the number of patients age 65 or older undergoing bariatric surgery increased from the year 2005 (when they accounted for 2%) to 2009 (when they accounted for 4.8%).

However, very few studies have provided information on the safety and effectiveness of bariatric surgery in older people. Several reports concluded that rates of perioperative morbidity and mortality are higher in older patients.[67–69] Surgery resulted in marked weight loss and improvement in obesity-related complications and physical disability in older patients, although by a lower rate than in younger patients.

Varela et al[70] examined the outcomes of bariatric surgery in a database from the University Health System Consortium Centers between 1999 and 2005. Patients over age 60 accounted for 1,339 (2.7%) of all bariatric operations performed. Compared with young and middle-aged patients, older patients had more comorbidities, longer hospital stays, and more complications, in addition to a higher in-hospital mortality rate. When risk-adjusted, the observed-to-expected mortality ratio for the older group was 0.9, compared with 0.7 in the young and middle-aged cohort.

Willkomm et al[71] found an apparently higher operative risk profile in those over age 65 (n = 100) than in younger patients (n = 1,374), with higher rates of sleep apnea, diabetes, and hypertension. However, the operative outcomes were similar in the two groups in terms of operative time, length of stay, and 30-day readmission rates. The authors concluded that patients over age 65 had excellent outcomes compared with younger patients, suggesting that older age is not a risk factor for complications or death with bariatric surgery.

The American College of Surgeons National Surgical Quality Improvement Program evaluated the outcomes of 48,378 adults with a BMI greater than or equal to 35 kg/m^2 who underwent bariatric surgery between 2005 and 2009.[66] During this time, the number of patients age 65 and older seeking bariatric surgery increased from 1.5% to 4%. A total of 1,449 patients were in this age range. Thirty-day mortality rates did not differ significantly by age group and were less than 1% for all age

ranges. Being age 65 or older was a significant predictor of prolonged length of stay but not of major adverse events. Significant predictors of major adverse events were a BMI greater than or equal to 55 kg/m^2, cardiac comorbidities, a severe American Society of Anesthesiologists score, albumin levels lower than 3 g/dL, and creatinine levels greater than 1.5 mg/dL.

The most up-to-date study of the outcomes of bariatric surgery in patients over age 70 was a retrospective review at a single institution from 2007 to 2008 of 42 patients who underwent bariatric surgery.[72] Twenty-two patients had laparoscopic gastric banding, 12 had laparoscopic sleeve gastrectomy, and 8 underwent laparoscopic Roux-en-Y gastric bypass. No patient died, complications occurred in 9 patients, and the rates of postoperative use of medications for hypertension, hyperlipidemia, diabetes, and osteoarthritis were reduced by about half. With the increasing number of patients seeking bariatric surgery, especially those over age 70, further prospective studies will determine if the outcomes are statistically significant.

If bariatric surgery is considered

The outcomes, complications, and mortality rates associated with bariatric surgery have been shown to be acceptable for adults age 65 and older. Perioperative risk assessment in the older obese patient seeking bariatric surgery is paramount to ensure that the benefits of the procedure justify any associated risks to the patient. Consequently, patients over age 65 should not be excluded out of hand: the patient's individual risk of major adverse events must be identified beforehand.

If the patient is at risk, efforts should be made to reduce the risk to an acceptable level, including cardiac risk stratification, optimization of drug therapy, and discussions with the bariatric surgeon to plan on a less-invasive laparoscopic procedure. Otherwise, older obese patients can safely proceed with conventional bariatric surgery, which will help them achieve durable weight loss, improve quality of life, and reduce associated comorbidities.

The aforementioned studies of bariatric surgery are retrospective, include small numbers of patients, and lack long-term follow-up. The issues of long-term safety and the risk of death and morbidity in the aging population will require randomized controlled trials to answer these important questions.

At our hospital, we have seen an increase in the number of patients referred for a possible additional procedure (revision) to correct a problem from a previous bariatric surgery. The problems arising from the previous surgery can lead to weight gain or to excessive weight loss and malnutrition. To date, our institution has no policy on when to consider a revisional procedure in an older patient. All patients, including older ones, are assessed for the procedure on a case-by-case basis.

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