

Information Statement

Obesity and Musculoskeletal Care

This Information Statement was developed as an educational tool based on the opinion of the authors. It is not a product of a systematic review. Readers are encouraged to consider the information presented and reach their own conclusions.

Background

Obesity negatively affects the orthopaedic management of nearly all musculoskeletal disease processes. An overweight individual is an adult who has a body mass index (BMI) between 25 and 29.9kg/m², while an obese individual is an adult with a BMI of 30kg/m² or higher. On the basis of global estimates by the World Health Organization (WHO) in 2016, approximately 1.9 billion adults (>18 years old) were overweight and 650 million were obese.¹ Currently, 42% of Americans are obese and rates are only expected to increase over time.² As the patient population continues to increase in age and size, appropriate management of patients will hinge upon decisions that incorporate the underlying disease processes that arise in the setting of an elevated BMI.

It is estimated that annual obesity-related healthcare costs are \$147 billion.³ Current projections calculate that if the obesity rate is held constant over the next 20 years, over \$549.5 billion dollars could be saved.⁴ Additionally, in the US adult population, the average QALY (Quality Average Life Years) lost per person due to obesity increased by 127% from 1993 to 2008.⁵ Numerous orthopaedic studies have concluded that the burden of obesity is significant on a variety of outcome measures including infection risk, non-union of fractures, persistent pain, cost, and implant failure.⁶⁻⁹

Whether obesity is a disease process, or a modifiable/non-modifiable risk factor remains a subject of debate. Although the answers to these questions are important, they may not aid in the approach to specific problems and issues faced by orthopaedic surgeons. The management of obese patients and the resulting complications after trauma surgery, total joint arthroplasty and spine surgery may differ from non-obese patients. Providing orthopaedic care to these patients will require expanding perspectives on treatment options, in addition to modified surgical technique and equipment, to ensure safe and high-quality care.

Co-Morbid Conditions and Peri-Operative Management

Direct relationships have been established between obesity and several conditions including diabetes, coronary artery disease, deep vein thrombosis (DVT), pulmonary embolus (PE), malignancy, obstructive sleep apnea, and asthma.¹⁰⁻¹² Although orthopaedic surgeons do not regularly manage these conditions, each condition can adversely affect surgical outcomes and the post-operative course of our patients.

Associated conditions in an obese individual that can affect pre-operative evaluation include malignancy, diabetes, venous thromboembolism, stroke, coronary artery disease, pancreatitis, cholelithiasis, Pickwickian syndrome, and obstructive sleep apnea.¹⁰⁻¹¹ Consequently, in the peri-operative period, obese individuals are more prone to premature complications and even death than non-obese individuals.¹³

General anesthesia poses specific challenges in the setting of obesity. Anesthetic intubation with fiber-optic intubation may facilitate appropriate ventilation.¹⁴ Regional anesthesia can be utilized to minimize these risks but may be difficult to perform adequately due to anatomic distortion. Individualized anesthetic plans should be developed in a scheduled preoperative evaluation.

Pressure ulcerations, nerve palsies, and compartment syndromes more readily occur in obese than non-obese individuals. As a result, care should be taken to thoroughly and adequately use well-padded tables and boards to prevent these iatrogenic conditions during surgery or other procedures.^{15,16}

Total Joint Arthroplasty

Obesity has a direct impact on the development of osteoarthritis of the hip and knee joints. In the knee, the Canadian Joint Registry data reported that the need to undergo a total knee arthroplasty was 8.5 times greater for individuals with a BMI > 30kg/m², 18.7 times more likely for those with a BMI > 35kg/m², and 32.7 times more likely in patients with BMI > 40kg/m² compared to individuals of normal weight (BMI < 30kg/m²).¹⁷ The number of obese patients undergoing total joint arthroplasty has continued to increase in the United States with the prevalence of obesity in patients undergoing total hip arthroplasty and total knee arthroplasty being over 52% and 70%, respectively. These rates are even higher in patients who undergo revision total joint arthroplasty.¹⁸

Obese individuals can benefit from total knee arthroplasty, but tend to have higher complication rates.^{19,20} The data is still unclear on whether functional outcomes differ in obese and non-obese individuals undergoing a total knee arthroplasty. There may be a "glass ceiling" in clinical improvement for obese individuals.²¹⁻²³

Morbidly obese individuals undergoing total knee arthroplasty have higher risks of infection, in-hospital death, increased blood loss, wound related problems, avulsion of the medial collateral ligament, component malpositioning, extensor mechanism rupture, patellar maltracking, increased length of stay, increased rate of discharge to facility, and increased costs.²⁴⁻²⁵

Complication rates also increase as BMI increases. In medial unicompartmental arthroplasty, obese individuals are more likely to develop component loosening, failure, and fracture. Additionally, obesity has been shown to have a negative impact on clinical outcomes.²⁶

Weight loss may reduce the risk for developing symptomatic knee osteoarthritis and may also lead to the resolution of arthritic symptoms.²⁷ The data is unclear but suggestive that marked weight loss is both not maintained, nor does it likely occur after a patient undergoes total joint arthroplasty, as patient activity does not change significantly.^{28,29}

For total hip arthroplasty, there appears to be evidence that obesity has a direct association with infection rates. Obese patients have higher risks for hardware malpositioning, thromboembolic events, higher blood loss, loosening, infection, and ultimately, catastrophic failure.³⁰ Currently, there is data that supports the use of total hip arthroplasty in obese individuals as functional outcomes and pain do improve in obese patients.³¹ However, recent literature has suggested obese patients with BMI over 40kg/m² are at a 3-fold increased risk of not meeting the minimal clinically important difference following THA with respect to functional outcome scores.³²

There may be a higher risk of DVT in obese individuals after undergoing total joint arthroplasty, although current data are insufficient to determine this as fact. A large database analysis study has suggested that obesity may increase the rate of PE and not DVT.^{33,34}

Although obesity is defined as a BMI > 30kg/m², patients with a BMI > 40kg/m² appear to have even higher complication rates after total joint arthroplasty and should be counseled as such prior to surgery with the odds of complications increasing dramatically in patients with BMI of 45kg/m² or greater.³⁵

Pediatrics

Obesity also affects approximately 18.5% of all children and adolescents in the United States, which is triple the rate from just one generation ago.³⁶ Unfortunately, this increase in obesity can lead to an increase in orthopaedic conditions that are associated with obesity. These include fractures, musculoskeletal discomfort, impaired mobility, lower extremity malalignment, and early arthritis.³⁷ Furthermore, obesity can cause vitamin deficiencies or hormonal imbalances that can lead to changes in children bone growth and overall musculoskeletal health.

Blount's disease is directly associated with pediatric obesity due to mechanical forces leading to varus deformity of the proximal tibia.³⁸ Furthermore, obese children also have increased risk for genu valgum and recurvatum.³⁹

Slipped capital femoral epiphysis (SCFE) has an increased incidence in obese adolescent to pre-teen males. The prevalence of SCFE is currently rising, along with presentation at an earlier age.⁴⁰ Although most cases of SCFE are unilateral, bilateral SCFE is seen more commonly in obese children.⁴¹

Obese pediatric patients are more likely to sustain fractures after a fall compared to non-obese children. In addition, these fractures are more likely to occur in the distal part of the extremity when compared to non-obese pediatric trauma patients. This includes the distal radius, distal tibia, and distal femur.⁴² This is thought to be due to the soft tissue protection over the diaphyseal portion of the bones. Given the increased soft tissue in obese patients, it is often more difficult to hold these fractures with a cast and therefore they often require surgical intervention for management.⁴³

Spine

Obesity is linked to increased rates of spine pathology including lower back pain, disc degeneration, and sciatica, along with increased rates of complications after spinal surgery.⁴⁴ Although low-back pain is associated with obesity, it may be affected by other confounding variables such as socioeconomic status, poor coping skills, and job dissatisfaction.^{45,46} Recent clinical studies concluded that gastric bypass patients demonstrated reduced low back pain after substantial weight loss and suggest that excess weight can lead to more pronounced symptoms.⁴⁷

Lumbar disc degeneration has also been associated with increased body weight. Although patients often claim that weight loss is inhibited by low back symptoms, surgical treatment for lumbar stenosis has not been shown to reduce body weight in obese patients.^{48,49} Pain relief is, however, successful.

Lumbar spine decompression procedures in obese patients have been associated with a higher risk of complications including hardware failure, infection, and venous thromboembolism.⁵⁰ In addition, patients who are obese often have longer operative times and increased blood loss, which can also be risk factors for postoperative complications.⁵¹ There is promise with newer percutaneous and less invasive treatments to diminish these risks.^{52,53}

When treating idiopathic scoliosis, obese surgical patients have higher complication rates than non-obese patients.⁵⁴ However, one of the difficulties in management may be poor brace fit and wear in obese individuals.

Shoulder and Elbow

As previously noted, soft tissue disorders occur more commonly in obese individuals. Rotator cuff tendonitis and shoulder impingement are two conditions that have been shown to follow this general trend.⁵⁵ Treating obese individuals with rotator cuff injuries has also shown to have a negative impact on the operative time, length of hospitalization, and functional outcomes.⁵⁶

As with any joint, shoulder arthroplasty requires precise osteotomies and careful soft tissue handling. In humeral head replacement surgery, obesity has been shown to be a risk factor requiring a revision surgery. Reverse shoulder arthroplasty has been shown to have successful clinical outcomes but with higher complication rates including need for revision in obese individuals.⁵⁷⁻⁵⁹

Hand

Surgical management of several hand conditions can be affected by obesity. Carpal tunnel syndrome has been shown to be directly correlated with obesity.⁶⁰ Weight loss, however, does not lead to an improvement of symptoms.⁶¹ Multiple trigger fingers have been shown to be more common in obese individuals than non-obese individuals.⁶² Generalized hand function can be affected by weight gain, as earlier onset of obesity has been shown to lead to a direct decrease in hand grip strength.⁶³

Foot and Ankle

Chronic overuse disorders of the foot and ankle are more common in obese individuals. This includes Achilles tendonitis, plantar fasciitis, and posterior tibial tendon dysfunction. As the posterior tibial tendon dysfunction progresses to a pes planus deformity, plantar fasciitis and Achilles tendonitis can be even more pronounced and difficult to treat.⁶⁴⁻⁶⁷ Additionally, stress fractures and Charcot feet are noted in obese individuals, as those conditions correlate with diabetes.

Sports and Arthroscopy

Obesity has been demonstrated to place individuals at risk for certain sports-related conditions, including meniscal tears and rotator cuff tears.⁶⁸ For rotator cuff tears specifically, increased BMI and percent body fat are additionally correlated with increased severity of the tear.⁶⁹ When arthroscopic surgery is performed for these conditions, the surgical procedure can be difficult due to the loss of superficial landmarks. There is debate whether obesity significantly affects functional results after such procedures with conflicting literature, but complications can be greater with the comorbidity of obesity.⁷⁰⁻⁷³

Obese patients undergoing anterior cruciate ligament (ACL) reconstruction are at a greater risk for developing post-traumatic osteoarthritis.⁷⁴

Malignancies

Obesity has been linked to several malignancies. Specifically, cancers of the colon, breast, endometrium, liver, kidney, esophagus, thyroid, stomach, pancreas, and gallbladder, along with leukemia have been associated with increasing BMI.^{75,76} When treating obese individuals with bone metastasis, surgeons should consider reconstructive procedures to handle long-term loads as patients with metastatic disease may have increased life expectancy with current oncologic treatments.⁷⁷⁻⁸⁰

Trauma

Although obese individuals sustain abdominal and pelvic injuries less commonly in motor vehicle accidents than non-obese individuals, they are at greater risk for distal femur, ankle, calcaneus and internal degloving injuries.⁸¹⁻⁸⁴ Low energy falls can lead to spontaneous knee dislocations that could lead to popliteal artery injuries and possibly amputation.⁸⁵ In the trauma setting, these patients present in a unique manner since there is limited time to counsel patients on the need to correct any metabolic and/or nutritional deficiencies that affect orthopaedic outcomes. Wound healing and deep infection are significant concerns due to the need for larger exposures and compromised blood supply to adipose tissue.

Obese elderly individuals more commonly develop extra-capsular proximal femur fractures, whereas non-obese individuals are more apt to develop intra-capsular femoral neck fractures. Additionally, in the setting of femoral shaft fractures, obese individuals are more likely to have a missed proximal femur fracture.⁸⁶ Due to the difficulty in placing an antegrade intramedullary nail, obesity is a relative indication for retrograde nail fixation or antegrade nail fixation in the lateral position. Multiple screw fixation is recommended to prevent hardware failure, especially when performing fixation around the ankle, joints, and pelvis.

Obesity increases difficulty in obtaining adequate intraoperative imaging and increases the risk of hardware failure, wound healing, and deep venous thrombosis in the trauma setting.⁸⁷⁻⁹⁰ Interestingly, in the hip fracture population, obesity may be protective with respect to morbidity and mortality after surgical fixation of hip fractures, which is known as the “obesity paradox.” However, recent literature suggests that this “paradox” does not apply to those individuals who are “super obese” with BMI > 50kg/m².⁹¹

Advanced imaging

Most MRI and CT scanners have weight limits that conventionally do not exceed 450 lbs. (202.5kg). Obese patients may not fit in these machines, or they may exceed the maximum weight limit and are therefore restricted from obtaining advanced imaging. The lack of discriminate information that can be obtained from these studies can directly lead to inaccurate, inappropriate, or unnecessary treatment. Individuals have been reported to be imaged in veterinary schools or zoos.

Office and Hospital-Based Care Setting Challenges

Physician office and hospital equipment can limit safe care for obese patients. Chairs and exam tables may have weight limits and sizes that may not accommodate obese patients. Likewise, operating room and procedure tables, as well as imaging tables and gantries may not support or function correctly above specific weight limits.

Patient movement and transfers can be more difficult and may represent safety hazards to patients and health care workers if done improperly.

Concerns regarding equal access to care and the negative impact of bias against obese patients have been raised in multiple medical fields.⁹²⁻⁹⁷ The AAOS believes that all patients deserve appropriate access and safety as they pursue care for their musculoskeletal problems. We support education of physicians and staff and appropriate resources to ensure safe and timely care for obese patients.

Projections

Annual medical costs related to obesity exceed \$147 billion. With the current plans for the enrollment of most uninsured individuals under the Patient Protection and Affordable Care Act and Medicaid expansion, current data suggest that obese individuals will comprise a large portion of those seeking insurance benefits, which will likely result in significantly higher government costs than previously projected due to the tremendous fiscal burden that obesity currently has on health care.⁹⁸

Conclusion

AAOS recognizes that obesity is not a choice, but rather a complex, multifactorial condition that affects many patients and, in most cases, contributes negatively to their musculoskeletal problems. Evidence exists that refusing surgery to obese patients has the effect of worsening societal and social disparities. Our approach to obese patients should encompass aid in the medical management of the issues associated with their obesity, as well as the potential surgical care that can help with both their general health as well as specific musculoskeletal problems. When surgery is considered, patients should be counseled regarding the potential increased perioperative risks associated with obesity.

As orthopaedic surgeons, we may be the one of the first physicians that these patients see. It is our responsibility to provide compassionate and supportive care to these patients even if an orthopaedic surgery is not indicated at the time of presentation. Many patients will benefit from nonoperative treatments for their musculoskeletal pain. Equally important, this is an opportunity for counseling, screening, and potential referral to specialists in nutrition, endocrine, and bariatric surgery. As a profession, we advocate for a multidisciplinary approach to care for these patients who are often complex and higher risk. Given the increasing incidence of obesity, improved coordination and increased resources in our health systems are needed to provide safe, optimal care for obese patients.

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