Movement Is Life—Optimizing Patient Access to Total Joint Arthroplasty: Obesity Disparities

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ABSTRACT

Thirty five percent of the American population is considered obese (body mass index [BMI] > 30). Obesity disproportionately affects African Americans, Hispanics, and women. Obesity is associated with postoperative complications, including wound complications, infections, and revision total joint arthroplasty (including total hip arthroplasty and total knee arthroplasty). Current BMI benchmarks (many institutions rely on a BMI of 40) selectively preclude patients from having surgery. Patients in these underserved populations can be optimized through the lens of shared decision making through the assessment of food security (eg, food deserts and food swamps), ability to afford healthy food, knowledge of social safety net and community resources to access healthy food, nutrition and weight loss referrals to programs that accept all forms of insurance, weight loss measurements as a percentage of body weight lost instead of BMI cutoffs, pharmacologic modalities, and bariatric surgery.

Obesity, defined as body mass index (BMI) > 30, is an ever-expanding challenge for adult reconstructive surgeons. Currently, 35% of the US population is considered obese, and the percentage of obese adults continues to increase in the United States and worldwide.[1] Moreover, there is an association between obesity and knee osteoarthritis; therefore, there will likely be increasing numbers of obese and morbidly obese individuals needing total joint arthroplasty (TJA) in the coming years. In addition, many obese individuals are surprisingly malnourished, with low levels of serum albumin, vitamin D, and iron.[2] Both nutrition and obesity are intricately linked to food security, with 10.5% of the American households being food insecure.[3] Food insecurity and the rates of obesity are higher in Hispanics, African Americans, and women, as well as those of lower socioeconomic status (SES).[3-8] Unfortunately, rates of obesity are higher in those who experience long-term chronic stress,[8] positioning women of color at the apex of risk for obesity. Collectively, this showcases that intersectionality creates a compounded risk for populations who are already marginalized in American society.

Breaking the vicious cycle of joint pain is challenging for those of lower SES. Obesity is associated with osteoarthritis, and osteoarthritis is associated with

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weight gain due, in part, to reduced mobility.[9,10] Severe osteoarthritis of the hip and knee can be effectively treated with total hip (THA) and total knee arthroplasty (TKA) that can reduce pain, improve mobility and function, and increase overall quality of life.[11,12] Racial disparities exist in access to TKA and THA: African American individuals are more prone to have severe hip and knee osteoarthritis[13-15] and report higher baseline knee pain and worse function[16] yet are markedly less likely to undergo TJA.[16,17] Rates of utilization of THA and TKA by obese patients are as high as one-thirds of total procedures[18] and have increased by approximately 1% each year since 1998.[19] Nevertheless, there is concern that the obese patient population still has lower access to THA and TKA compared with other populations, and with increased emphasis on value-based health care, access to effective TJA may be even further diminished in coming years. A recent survey of the American Association of Hip and Knee Surgeons demonstrated that with the influence of value-based health care, 52% of the surgeons required a BMI of <40 before agreeing to perform elective THA or TKA.[20]

Clinical Implications of Obesity Related to Total Knee Arthroplasty and Total Hip Arthroplasty

Obesity presents an independent risk factor for perioperative complications after THA and TKA, including increased wound complications, infection, issues of airway accessibility for intubation and ventilation, and higher revision arthroplasty rates.[19,21-23] In addition, obesity is highly associated with a number of notable comorbidities, including chronic kidney disease,[24,25] type 2 diabetes mellitus,[26] depression,[27] and coronary artery disease,[28] which are also independently associated with increased postoperative complications.[29-32] Therefore, obesity, particularly when associated with comorbidities, creates a compounded increased risk of perioperative complications after TJA.[33]

Obese patients have observed lower preoperative function and mobility, and data in the postoperative period surrounding validated outcome measures, functional scores, and satisfaction have shown wide variability.[34-39] However, several studies have shown equal or greater improvements in validated outcome scores,[37] function,[39] and satisfaction[38] compared with nonobese patients after surgery. Furthermore, TKA is highly cost-effective in morbidly obese patients with a BMI of >40, even when taking into consideration the higher complication rates seen among morbidly obese patients.[40] Therefore, even with an increased risk of complications, obesity should not serve as a barrier because of outcome measures. Although there are no strict exclusion criteria for THA or TKA based on BMI, the increased risk of complications and increased cost associated with undertaking arthroplasty in these patients[41] has created a barrier for patients with higher BMI (>40) to access this life-changing surgery, perpetuating a cycle of inequity in the healthcare system, especially given the link of obesity rates to minority races and lower SES.

Some surgeons recommend deferring THA and TKA for patients with obesity category III (BMI 40 to 45),[20] given evidence in the literature demonstrating increased complications in this morbid obesity category.[42] However, the ethics of denial of TJA in patients with a BMI of > 40 is debated because some investigators have found no or only modest, increased risk,[43] particularly when controlling for nutrition status and other obesity-related comorbidities.[44-46] Although there may be an increase in perioperative complications, the outcomes of TJA remain excellent, even in the morbidly obese cohort. In one study of 1,614 consecutive patients undergoing primary TKA, of which 22% were morbidly obese, patients were risk-stratified and comorbid conditions optimized. Although there were increased costs and resource utilization for the morbidly obese cohort, there was no increase in perioperative complications or readmissions seen in this group.[47] Furthermore, it is important to note that patients with a BMI of > 40 with advanced hip or knee osteoarthritis and limited mobility who are advised to lose weight to become candidates for THA or TKA are typically unsuccessful in this effort. The literature reports that only 20% of the patients are ultimately able to receive TJA when this strict cutoff of BMI < 40 was used.[48] This cutoff may lead to more progressive destruction to the joint, functional limitations, diminished mobility, progressive pain, increased risk of falls, and exacerbation of comorbidities.

Strategies to Optimize

Identifying effective strategies to optimize the patient with a BMI of > 40 is vital to adequately treat and reduce risk in this population. Such efforts will also reduce health disparities because this level of obesity is more prevalent in women and individuals of color.

Various preoperative optimization strategies are currently being conducted by experts in the field of arthroplasty in obese patients. A qualitative survey study was

conducted with 16 members of the orthopaedic surgical care team across eight institutions: New York University, OrthoVirginia, Hospital for Special Surgery, Yale New Haven Health, Louisiana State University, Brigham and Women's Hospital, and the Hospital of the University of Pennsylvania—Penn Presbyterian, and Dr. Carlos Lavernia (private practice). These institutions and individuals were chosen because of their national reputations and peer-reviewed publications focused on improving access for vulnerable populations. The strategies collected include both evidenced-based and individualized optimization protocols. Importantly, there was wide variability in optimization protocols and members of the surgical care team, both within and across institutions.

The interviews were structured, but qualitative. All experts were asked at least the following questions:

(1) Does your institution follow any strict cutoff for BMI for those patients contemplating TJA? If so, what is this cutoff?
(2) If no explicit, strict cutoff, does your institution suggest any BMI above which it is not recommended to operate on patients for TJA?
(3) Do you personally have a BMI above which you do not feel comfortable operating on for TJA?
(4) Are there any other factors pertaining to obesity that influence your decision to operate?
(5) If you identify a patient who wishes to pursue TJA with an elevated BMI, what is the next step?
(6) If you identify a patient with an elevated BMI, is there an optimization strategy in place? If so, what is/are that/those optimization strategy/strategies? If no, what happens to these patients?
(7) What members make up your surgical care team? If applicable, what members make up your care optimization team?
(8) What resources have you personally identified within or near your institution that have proven beneficial in optimizing patients with elevated BMI before TJA surgery?

Care Team Roles and Responsibilities

Care teams are variable and can exist as follows: surgeon-driven optimization, surgeon direction to nurse navigator optimization team, or surgeon referral to other providers for collaboration. Optimization processes also varied based on the institution and care team composition. Based on consensus, it is strongly advocated that surgeons should participate in setting the weight loss goal that would optimize the patient becoming a surgical candidate. The entirety of the weight loss optimization process is provided in Table 1. Although we support promoting and encouraging weight loss to allow preoperative optimization, we do not advocate for strict BMI cutoffs, which diminish access to highly successful TJA for patients who often are not able to achieve sufficient weight loss to meet arbitrary BMI thresholds. Notably, the increase in infection and perioperative complications related to obesity increase as a continuous variable with increasing obesity but do not increase exponentially at any specific interval cutoff value.[49] Therefore, we anticipate weight loss of any specific amount will also diminish complications, but not at a specific threshold. For example, the perioperative risks at a BMI of 39 and 41 are far more related to other comorbidities than BMI alone.

Identification and Screening

Recommending weight loss through diet and exercise is advocated for all obese patients (BMI $>$ 30) presenting with hip or knee pain. However, it is important that patients follow recommendations of their primary care providers (PCPs), or if appropriate, cardiac or pulmonary specialists, to assure that the intensity of exercise is safe, particularly with preexisting cardiac and pulmonary diseases. Although we would support using a BMI of $>$ 35 or BMI of $>$ 40 as a guideline to start patient preoperative optimization, when patients demonstrate genuine attempts at weight loss but are not successful, we support optimization of other modifiable comorbidities, such as diabetes control, optimization of nutrition and serum albumin, emphasis on smoking cessation, and optimization of vascular disease or lymphedema. Once these comorbidities are appropriately optimized, we would support surgical intervention or referral to a center with sufficient resources to allow safe TJA for patients with a BMI of $>$ 40, with modest but acceptable risk. Optimization should begin early, ideally once the surgeon identifies the patient as a THA/TKA candidate. The earlier the better, as patients who are in a weight cycle may be in a catabolic state, putting them at additional risk for poor wound healing and infection.[50]

Once identified, best practices include facilitating weight loss and optimization of comorbid conditions, which can be conducted by a combination of nurse navigators, physician associates, case managers, weight loss specialists, mental health specialists, or orthopaedic surgeons. We advise the assessment of patient nutrition, food security, support at home, and resources for food procurement. It is important to determine access to resources and proximity to healthy and fresh food, including financial means and transportation. Food

Table 1. Overview of the range of optimization team members, pertinent screening questions, and optimization strategies across the leading institutions interviewed

Optimization Strategy
Population
• BMI >40
Optimization team
• Varies widely across institution from surgeon-only to entire team of nurse navigators
• Key players
Nurse navigators
Physician associates
State-wide case managers
Social workers
Orthopaedic surgeon
Optimization timeframe
• 4 wk-3 mo before surgery
• Surgical date may be depending on optimization plan and patient progress
Screening
• Food security
• Resources (eg, finances and transportation) to access healthy food
• Social support system
• Ability to exercise
• Nutrition status
Albumin (<3.5 g/dL)
Vitamin D (<30 ng/dL)
Transferrin (<200 mg/dL)
TLC (<1,500 cells/mm^3)
Weight loss goals
• Goal-setting based on provider and patient ability/ preference
5-10% weight loss
BMI<40
Reduce comorbidity burden
• Improve DM
• Improve HTN
Referrals
• PCP
• Nutritionist/weight management consultant
• Weight loss programs
• Behavioral counseling

(*continued*in next column)

Table 1. (*continued*)

Optimization Strategy
Weight loss strategies
• Nutritionist consult
• Weight loss programs (tailored to screening results)
• Pharmacotherapy (eg, lorcaserin)
• Bariatric surgery
• Behavioral counseling
• Online platforms
YouTube
Dieting apps
Support networks
Nutrition strategies
• Preoperative supplementation with omega 3 fatty acids and arginine; protein shakes
• Community partners
Institutional funding for food procurement
Meals on wheels
Local food shelters
Government social support programs (eg, SNAP)
Local organizations (eg, churches, community organizations, and neighborhood management teams)
Medicaid escalation unit (if available in your state)

BMI, body mass index (kg/m^2); DM, diabetes mellitus; HTN, hypertension; PCP, primary care provider; SNAP, supplemental nutrition assistance program; TLC, total lymphocyte count

deserts are associated with obesity even after controlling for home environment factors[51] and food swamps—defined as high-density areas that sell high-calorie fast food at the expense of healthier food options—predict obesity even better than food deserts.[52] These should be incorporated into the assessment for appropriate optimization strategies. Serum albumin, vitamin D, and iron levels should be reviewed because a low albumin level is the single most important predictor of poor surgical outcomes.[53]

Patient Weight Loss Goals

Individualized patient weight loss goals should then be set based on a combination of physician and patient input and ability. When there is shared decision-making, patients are more successful at losing weight.[54] Weight loss goals can be set by surgeon, PCP, weight management consultant, or nutritionist. Goals should be very clear and established at the outset, should allow for some flexibility, and should consider previous weight loss.

Patients can work toward either BMI < 40 or 5% to 10% total body weight loss,[55] depending on the holistic patient profile (eg, comorbidity burden and nutrition status). There are guidelines from leading experts in the field which recommend using a BMI of < 40 cutoff before elective THA and TKA.[20] This represents an attractive goal, but may be difficult for patients to achieve, let alone maintain over time.[56,57] Recent studies have found that weight loss of as little as 5% of the body mass can lead to notable improvements in the metabolic profile (eg, glucose and lipid levels, cardiac profile)[56-60] and decreased surgical complications.[55-57,60,61] However, it is important to note that studies using lifestyle modification for weight loss excluded patients with advanced lower extremity joint disease who may suffer cardiac complications with moderate exercise.[59]

Weight Loss Strategies

Ideal strategies for weight loss should be tailored to the patient at the discretion of surgeon, nurse navigator, or weight management consultant. Strategies should consider a spectrum of treatment options, including nutrition consults (ideally those that accept all forms of insurance), weight loss programs (tailored to specific means, based on ability to exercise, and ability to procure healthy food), pharmacotherapy, and bariatric surgery. Best practice optimization paradigms should also consider monitored monthly or bimonthly weigh-ins or reports. For patients who live in food deserts or lack adequate means to procure healthy food, community partners (eg, Meals on Wheels and local food shelters) and social support programs (eg, supplemental nutrition assistance program) should be leveraged by nurse navigators or social workers. When available, funding sources should be provided, especially for food procurement. To promote success in optimization, care team members should have access to a resource spreadsheet inclusive of all community and institutional resources. This can be generated with the efforts of social workers and nurse navigators. Partnering with local churches, community organizations, and local neighborhood management teams can be used to further leverage available community resources. In some states, eligible patients can be referred to the Medicaid Escalation Unit by nurse navigators or surgeons for additional assistance.

Any strategy can be accompanied by surgeon or PCP referral to behavioral counseling, which can serve to reinforce positive behaviors over time.[59] Behavioral counseling has adapted the smoking cessation paradigm of the 5 A's (Assess, Advise, Agree, Assist, and Arrange).[62] This is especially helpful for patients who have had difficulty losing weight or maintaining reduced weight. In addition, patients who are malnourished can be prescribed preoperative supplementation of omega 3 fatty acids and arginine, as well as protein shakes, which decrease risk of infection, length of stay, and hospital-related expenses.[63-65]

Other important options include pharmacotherapy because five medications (lorcaserin, orlistat, phentermine-topiramate extended release, liraglutide, and naltrexone-bupropion extended release) have been approved for long-term use in obesity. These drugs can be prescribed by PCPs, endocrinologists, or weight management consultants and are considered safe in the preoperative period. These drugs have been associated with a loss of 5% to 15% of the body mass[66] and are attractive options for individuals with severely decreased mobility because of their osteoarthritis. Prescribers must consider patient insurance status and ability to pay. Consultation with social workers should be undertaken in patients who are underinsured/uninsured.

An option for individuals who have not been successful with other, more conservative methods can be referred to bariatric surgery. This represents one of the most effective options for people who are obese to lose weight and decrease their associated comorbidities before surgery.[67] Importantly, bariatric surgery requires planning in advance of surgery.[68] A recent meta-analysis demonstrates substantial long-term maintenance of weight loss after gastric bypass, further positioning bariatric surgery as a good option for patients with osteoarthritis.[69] Although bariatric surgery may support effective weight loss and optimization of obesity-related comorbid conditions, it is important to recognize that bariatric surgery has its own set of surgical risks. Studies do not support the effectiveness of bariatric surgery leading to decreases in perioperative complications, even when there is successful weight loss.[70] Some surgeons have hypothesized that risks are increased in patients after bariatric surgery compared with obese patients who have not undergone bariatric surgery because of increased difficulty absorbing nutrients and resulting malnutrition.[71]

Finally, in the modern era, especially in the times of pandemic isolation, many online platforms, support networks, dieting apps, and free workout YouTube channels have become mainstream options for individuals with access to the relevant technology.

Summary Take-home Message

Obese patients with severe hip and knee osteoarthritis can greatly benefit from THA and TKA. Based on

interviews with leaders in the field of arthroplasty regarding obesity and osteoarthritis, we identified optimization strategies to successfully support these patients becoming eligible surgical candidates. This article provides updated tools for screening, including nutritional status, food security, and resources to access healthy food; updated guidance on weight loss goals, shifting from exclusively BMI < 40, and instead considering 5% weight loss; and various mechanisms of weight loss accessible to all. We focus on leveraging community and internal systems, ideally with the help of social workers, nurse navigators, and physician associates. We recommend a multidisciplinary approach to preoperative optimization. When these optimization strategies are deployed, THA and TKA can be delivered equitably and safely to obese patients and can serve to reduce presumed associated risks, as well as existing healthcare disparities across racial and socioeconomic lines. These recommendations are timely, given the ever-increasing obesity epidemic in the United States.[1] Currently, the Centers for Medicare and Medicaid Services is considering the inclusion of optimization as reimbursable work for orthopaedic surgeons. Given the improvements in quality of life THA and TKA can offer,[37] it is imperative that we have resources available to serve this population.

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