

Hip and Knee Arthroplasty:  
Pre-op Optimization Improves Outcomes  
Harry A. Demos, MD  
Department of Orthopaedics and Rehabilitation

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**I (and/or my co-authors) have  
nothing to disclose.**

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**Goals and Objectives**

- Discuss the assessment (including radiograph findings) and treatment of hip and knee osteoarthritis
- Identify important considerations for surgical planning
- Implement protocols and programs for patient optimization

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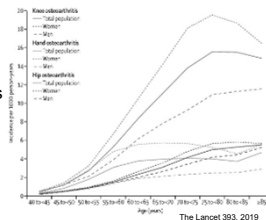
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### “It’s Just Arthritis”

- 46.9 Million Americans affected
- 21% of Americans with diagnosis
- 50% in >65 year-old population
- 78.4 Million expected by 2040
- Knee is 85% burden of OA
- Limitations



- › walking 1/4 mile—6 million
- › stooping/bending/kneeling—7.8 million
- › climbing stairs—4.8 million
- › social activities such as church and family gatherings—2.1 million

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### Economic Impact

- Fourth leading cause of disability
- 34% of lost work days
- 30.6% of arthritis patients have work limitations
- \$128 Billion in costs in 2003
  - › \$80.8 Billion in direct medical costs
  - › \$47 Billion in earnings losses
- Medical cost is 1-2.5% of GDP

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### Risk Factors

- Age
- Female Sex
- Obesity
- Previous injury
- Knee malalignment
- Quad Weakness
- Acetabular dysplasia
- Cam Deformity
- Heavy work activities or Impact sports
- Genetic predisposition

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### Conservative Treatment

- Activity modification / assistive devices
- NSAIDS
- Topical ointments and patches
- Bracing / shoe modifications
- Physical therapy / exercise
  - › 3x/week decreases disability 47%
- Weight loss
  - › 11 lbs reduces risk of knee arthritis in women by 50%
- Injections
  - Corticosteroid
  - Hyaluronic acid
  - Stem cells / PRP

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### Management of Osteoarthritis of the Knee (Non-Arthroplasty)

#### Evidence-Based Clinical Practice Guideline

*Adopted by:*  
The American Academy of Orthopaedic Surgeons Board of Directors  
August 31, 2021

*Endorsed by:*




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### Conservative Treatments

- Lateral wedge insoles are not recommended for patients with knee osteoarthritis.
  - Strength of Recommendation: Strong
- Canes could be used to improve pain and function in patients with knee osteoarthritis.
  - Strength of Recommendation: Moderate
- Brace treatment could be used to improve function, pain, and quality of life in patients with knee osteoarthritis
  - Strength of Recommendation: Moderate (downgrade)
- The following Oral/Dietary supplements may be helpful in reducing pain and improving function for patients with mild to moderate knee osteoarthritis; however, the evidence is inconsistent/limited and additional research clarifying the efficacy of each supplement is needed.
  - Turmeric
  - Ginger extract
  - Glucosamine
  - Chondroitin
  - Vitamin D
    - Strength of Recommendation: Limited (downgrade)

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**Conservative Treatments**

- Supervised exercise, unsupervised exercise, and/or aquatic exercise are recommended over no exercise to improve pain and function for treatment of knee osteoarthritis.
  - Strength of Recommendation: Strong
- Neuromuscular training (i.e. balance, agility, coordination) programs in combination with traditional exercise could be used to improve performance based function and walking speed for treatment of knee osteoarthritis.
  - Strength of Recommendation: Moderate (downgrade)
- Self-Management programs are recommended to improve pain and function for patients with knee osteoarthritis.
  - Strength of Recommendation: Strong
- Patient Education programs are recommended to improve pain in patients with knee osteoarthritis.
  - Strength of Recommendation: Strong
- Sustained weight loss is recommended to improve pain and function in overweight and obese patients with knee osteoarthritis.
  - Strength of Recommendation: Moderate (downgrade)

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**Conservative Treatments**

- Manual Therapy in addition to an exercise program may be used to improve pain and function in patients with knee osteoarthritis.
  - Strength of Recommendation: Limited (downgrade)
- Massage may be used in addition to usual care to improve pain and function in patients with knee osteoarthritis.
  - Strength of Recommendation: Limited (downgrade)
- FDA-approved laser treatment may be used to improve pain and function in patients with knee osteoarthritis.
  - Strength of Recommendation: Limited (downgrade)
- Acupuncture may improve pain and function in patients with knee osteoarthritis.
  - Strength of Recommendation: Limited (downgrade)
- Transcutaneous Electrical Nerve Stimulation: Modalities that may be used to improve pain and/or function in patients with knee osteoarthritis include:
  - a. Transcutaneous Electrical Nerve Stimulation (pain)
    - Strength of Recommendation: Limited (downgrade)
- Percutaneous Electrical Nerve Stimulation/Pulsed Electromagnetic Field Therapy: Modalities that may be used to improve pain and/or function in patients with knee osteoarthritis include:
  - a. Percutaneous Electrical Nerve Stimulation (pain and function)
  - b. Pulsed Electromagnetic Field Therapy (pain)
    - Strength of Recommendation: Limited (downgrade)
- Extracorporeal Shockwave Therapy may be used to improve pain and function for treatment of osteoarthritis of the knee.
  - Strength of Recommendation: Limited (downgrade)

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**Pharmacologic Treatments**

- Topical NSAIDs should be used to improve function and quality of life for treatment of osteoarthritis of the knee, when not contraindicated.
  - Strength of Recommendation: Strong
- Oral NSAIDs are recommended to improve pain and function in the treatment of knee osteoarthritis when not contraindicated.
  - Strength of Recommendation: Strong
- Oral Acetaminophen is recommended to improve pain and function in the treatment of knee osteoarthritis when not contraindicated.
  - Strength of Recommendation: Strong
- Oral Narcotics, including tramadol, result in a significant increase of adverse events and are not effective at improving pain or function for treatment of osteoarthritis of the knee.
  - Strength of Recommendation: Strong

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### Procedural Treatments

- Hyaluronic Acid intra-articular injection(s) is not recommended for routine use in the treatment of symptomatic osteoarthritis of the knee.
  - Strength of Recommendation: Moderate (downgrade)
- Intra-articular (IA) Corticosteroids could provide short-term relief for patients with symptomatic osteoarthritis of the knee.
  - Strength of Recommendation: Moderate (downgrade)
- Platelet-rich Plasma (PRP) may reduce pain and improve function in patients with symptomatic osteoarthritis of the knee.
  - Strength of Recommendation: Limited (downgrade)
- Denervation Therapy may reduce pain and improve function in patients with symptomatic osteoarthritis of the knee.
  - Strength of Recommendation: Limited (downgrade)
- Dry Needling In the absence of reliable evidence, it is the opinion of the workgroup that the utility/efficacy of dry needling is unclear and requires additional evidence.
  - Strength of Recommendation: Consensus

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### Surgical Treatments:

- Arthroscopy with lavage and/or debridement in patients with a primary diagnosis of knee osteoarthritis is not recommended.
  - Strength of Recommendation: Moderate
- Partial Meniscectomy can be used for the treatment of meniscal tears in patients with concomitant mild to moderate osteoarthritis who have failed physical therapy or other nonsurgical treatments.
  - Strength of Recommendation: Moderate
- High Tibial Osteotomy may be considered to improve pain and function in properly indicated patients with unicompartmental knee osteoarthritis.
  - Strength of Recommendation: Limited (downgrade)
- Free Floating Interpositional Devices: In the absence of reliable or new evidence, it is the opinion of the work group not to use free-floating (un-fixed) interpositional devices in patients with symptomatic medial compartment osteoarthritis of the knee.
  - Strength of Recommendation: Consensus

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### Joint Replacement Indications

- Osteoarthritis, inflammatory arthritis, post traumatic arthritis, avascular necrosis, fracture, malignancy
- Pain relief
  - Not responding to conservative treatment
  - Impacting quality of life and ADL's
- Correction of deformity
  - Malalignment
  - Contractures

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PJI Risk Assessment

- Identify increased risk
- Preoperative counseling
  - › Consideration of non-operative management
  - › Shared decision-making
  - › Manage expectations
- Address modifiable factors

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Prevalence of Modifiable Surgical Site Infection Risk Factors in Hip and Knee Joint Arthroplasty Patients at an Urban Academic Hospital  
JOA 29 (2014) 272-276

- 80% of primary TJA and 93% of revisions had a modifiable risk factor
- Most common were
  - Obesity (46%)
  - Anemia (29%)
  - Malnutrition (26%)
  - Diabetes (20%)
  - Smoking (10% overall, 21% with PJI)
- HIV and UTIs more common in patients undergoing surgery for PJI

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Evaluation of a Preoperative Optimization Protocol for Primary Hip and Knee Arthroplasty Patients  
JOA 33 (2018) 3642-3648

- Pre-operative screen for 19 "red flag" and "yellow flag" risk factors
- 74% had at least 1 risk factor
- Most common were
  - Obstructive sleep apnea (52%)
  - Depression (22%)
  - Obesity (13%)
- 20% of patients did not follow through with recommended optimization
  - Most common limiting factor was time

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## Diabetes

- Known risk in cardiac, vascular, general, colorectal, spinal, pancreatic, and breast surgery for decades.
- Perioperative hyperglycemia
  - Microvascular effects
  - Inhibition of complement function
  - Increases in cytokines
  - Inhibition of chemotaxis
  - Impaired phagocytosis
  - Impaired O2 delivery




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## Perioperative Issues – Glucose Control

- JBJS 2009 Marchant, et al
  - Retrospectively compared over 1M TJA patients with controlled DM, uncontrolled DM, and no DM from Nationwide Inpatient Sample database
  - Uncontrolled versus controlled resulted in increase in:
 

|                       |                         |
|-----------------------|-------------------------|
| • CVA – 3.42x         | UTI – 1.97x             |
| • Ileus – 2.47x       | Hemorrhage – 1.99x      |
| • Transfusion – 1.19x | Wound infection – 2.28x |
| • Death – 3.23x       | Length of stay – 1 day  |

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## Glucose Control

Currently only being reported to CMS for cardiac surgery  
 Probable future quality indicator for TJA  
 Monitored at MUSC for JCAHO Center of Excellence for DM certification  
 Monitor percentage of DM patients with BS > 200 and those without HgA1C level




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### Glucose Control on TJRU

15 patients having elective surgery had post op BS > 200  
11/15 had pre-op medicine consult  
3 arrived on unit with BS>200  
5 had pre-op glucose over 140  
1 had > 450 at pre-op w/u, another 310  
46% had HgA1C, 2 were > 9  
60% had no perioperative insulin coverage ordered

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### MUSC Protocol

Screening POC HgA1c in clinic when diabetic patients posted.  
Letter generated to PCP if >8.0  
If BS > 250 at workup, delay surgery  
If fasting BS > 250 on AM of sx, cancel  
Sliding scale insulin post-op  
Hospitalists and DMS consults  
Consider antibiotic cement

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### Urinary retention / UTI's

- David and Vrahas - J Am Acad Orthop Surg 2000;8:66-74
- Strong association between post-op UTI and PJI
- Unknown association between pre-op UTI and PJI
- Dysuria, urgency, frequency are frequently absent in elderly
- 10,000 wbc/ml and 1000 bacteria cutoff, if symptomatic
- Can treat asymptomatic (>100K bacteria) patients post-op
- Routine perioperative prophylaxis may be enough
- Obstructive symptoms or irritation should post-pone surgery until treated
- Bladder catheters should be removed within 24 hours post-op
- Urinary retention → 6% risk of PJI

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## Obesity

- 502M obese worldwide
- 1/2 TJA patients are obese
- 6.7x higher PJI for TKA, 4.2x for THA
- Consider pre-op weight-loss surgery
- Evaluate for malnutrition
- Evaluate for diabetes
- Optimize antibiotic doses
- Avoid weight loss in immediate pre-op period




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### The Influence of Obesity on the Complication Rate and Outcome of Total Knee Arthroplasty A Meta-Analysis and Systematic Literature Review JBJS 2012;94:1839-44

- 20 study meta-analysis
- Infection more common in obese patients: OR=1.90
- Deep infection requiring revision: OR=2.38
- Revision for any reason: OR=1.30




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### The effects of obesity and morbid obesity on outcomes in TKA

- J Knee Surg. 2013 Apr;26(2):83-8.
- Literature review of 24 studies
- 88% 5-year survival in morbidly obese, 95% in obese, 97% in nonobese
- Knee Society objective and function scores lower for morbidly obese, but not for obese
- 22% complications in morbidly obese, 15% in obese, 9% nonobese
- Suggested consideration of "cutoff" at BMI >40

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**Does morbid obesity affect the outcome of total hip replacement?: an analysis of 3290 THRs**

J Bone Joint Surg Br. 2011 Mar;93(3):321-5

- Lower pre and post-op outcome scores in morbidly obese
- Greater improvement in scores in morbidly obese
- Survivorship and and complications similar
- Slightly higher revision for infection
- « withholding surgery based on the BMI is not justified »




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**Obesity and total joint arthroplasty: a literature based review**

JOA 2013 May;28(5):714-21

- Workgroup of the American Association of Hip and Knee Surgeons Evidence Based Committee
- Patients with BMI >35 require TJR 7 years earlier
- Clear association between knee OA and obesity
- Strong association with other comorbidities
- Degree of improvement controversial
- Increased risk of perioperative complications
- Morbid and super obese patients may have complications that outweigh benefits with TJA
- Recommended consideration of delaying TJA
- Acknowledged that surgery may be unavoidable in this population




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**The Fate of Morbidly Obese Patients With Joint Pain: A Retrospective Study of Patient Outcomes**

Russell A. Reeves, MD, MS<sup>1</sup>, Glenn D. Heffer, MS<sup>2</sup>, Vincent D. Pellegrini Jr., MD<sup>3</sup>, Jacob M. Drew, MD<sup>4</sup>, William R. Barfield, PhD<sup>5</sup>, Harry A. Demos, MD<sup>6</sup>

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 weight loss

**ABSTRACT**

**Background:** The number of obese patients seeking a total joint arthroplasty (TJA) continues to increase. Weight loss is often recommended to treat joint pain and reduce risks associated with TJA. We sought to determine the effectiveness of an orthopedic surgeon's recommendation to lose weight.  
**Methods:** We identified morbidly obese (body mass index [BMI] 40-49.9 kg/m<sup>2</sup>) and super obese (BMI ≥ 50 kg/m<sup>2</sup>) patients with hip or knee osteoarthritis. Patients with less than 3 months follow-up were excluded. Patient characteristics (age, gender, BMI, comorbidities), disease characteristics (joint affected, radiographic osteoarthritis grading), and treatments were recorded. Clinically meaningful weight loss was defined as weight loss greater than 5%.  
**Results:** Two hundred thirty-four morbid and 59 super obese patients were identified. Super obese patients were more likely to be referred to weight management (52.0% vs 21.7%, P < .001) and were less likely to receive TJA (26.8% vs 41.7%, P = .004). Each 1 kg/m<sup>2</sup> increase in BMI decreased the odds of TJA by 10.0% (odds ratio = 0.891 95% confidence interval: 0.813-0.973, P = .001). Forty (23.0%) of the nonoperatively treated patients achieved clinically meaningful weight loss, and 10 (17.0%) patients who underwent TJA lost weight before surgery. After surgery, the number of patients who achieved a clinically meaningful weight loss grew to 32 (50.2%).  
**Conclusion:** In morbid and super obese patients, increasing BMI reduces the likelihood that a patient will receive TJA, and when counseled by their orthopedic surgeon, few patients participate in weight-loss programs or are otherwise able to lose weight. Weight loss is an increasingly modifiable risk factor for joint replacement surgery.

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### Fate of Obese Patients at MUSC

- Is morbid obesity a “modifiable risk factor?”
- 40 (23.0%) of the nonoperatively treated patients achieved clinically meaningful weight loss
- 19 (17.9%) patients who underwent TJA
- lost weight before surgery
- After surgery, the number of patients who achieved a clinically meaningful weight loss grew to 32 (30.2%)
- Less than 30% enrollment in weight-loss or bariatric surgery programs.
- Each 1 kg/m2 increase in BMI decreased the odds of TJA by 10.9%

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### Tobacco Use

- Most frequently occurring modifiable risk factor
- 3X more wound healing complications
- 3-4X higher non-union in spinal fusion and fractures
- Decreases oxygen delivery to wound (CO)
- Vasoconstriction (nicotine)
- Impaired angiogenesis
- 4-6 weeks interruption

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### Preoperative Smoking Cessation as a Durable Form of Long-Term Smoking Cessation

Jacob C. Balmer, BS<sup>1</sup>; Ashley B. Anderson, MD<sup>2</sup>; William R. Barfield, PhD<sup>1</sup>; Vincent D. Pellegrini, MD<sup>1</sup>; and Harry A. Demos, MD<sup>1</sup>

*Smokers who undergo total joint arthroplasty (TJA) face increased rates of medical and surgical complications that can be reduced by preoperative smoking cessation. We investigated the long-term durability of preoperative smoking cessation among TJA patients. Twenty-seven TJA patients who were identified as having an active history of smoking at the preoperative appointment before TJA consented to telephone survey about their perioperative and current smoking status. Average time from operation to survey was 3.7 years. Of the 27 patients, 21 (77.8%) were identified as having quit smoking prior to surgery. Of these 21 patients, 10 (47.6%) self-reported continued abstinence from smoking at the time of survey. Our cessation rate was significantly lower than reported long-term smoking cessation rates with standard therapies ( $p < 0.001$ ). Our results suggest that preoperative counseling and a requirement for smoking-cessation prior to elective TJA may have long-term durability that exceeds that of popular reported methods. (Journal of Surgical Orthopaedic Advances 29(2):102-105, 2020)*

Keywords: smoking cessation, total joint arthroplasty, quality improvement, hip, knee

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### Tobacco Cessation at MUSC

- Pre-operative counselling
- Nicotine and cotinine levels at workup
- Phone survey at average of 3.7 years (12 months minimum)
- 77.8% quit smoking prior to surgery
- 47.6% continued abstinence since surgery
- Higher cessation rates than other methods in the literature

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### Rheumatoid Arthritis

- RA 2-3X risk of PJI over OA
- Combination of autoimmune immunosuppression and medications
- NSAIDs, prednisone, MTX, and biologic agents are all associated with wound healing complications and PJI
- Discontinue non-selective NSAIDs – bleeding risk
- Sulfasalazine can be continued, but may increase INR in patients on warfarin
- Hydroxychloroquine (Plaquenil) is safe to continue peri-op and may decrease VTE (Johnson, CORR 1979)

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A Systematic Review and Meta-Analysis Comparing Complications Following Total Joint Arthroplasty for Rheumatoid Arthritis Versus for Osteoarthritis  
Arth & Rheu 2012;64:3839-49

- 40 studies
- Increased risk of dislocation in RA after THA – OR=2.16
- Increased risk of infection in TKA
- No difference in 90 day mortality or VTE

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## Corticosteroids



- Immunosuppression
- Decreased inflammatory response
- Poor wound healing
- Increased protein catabolism
- Bone loss
- Withdrawal → disease flares and adrenal insufficiency
- Continue normal dose peri-op
- Consider stress-dose hydrocortisone (50-100mg with 1-2 day taper)

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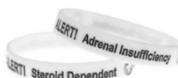
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## Adrenal insufficiency

- Friedman, et al. (JBJS 1995;77:1801-1806)
- Prospective study of 28 patients with 35 operations
- 1-20mg prednisone for 6 months to 32 years
- No stress-dose steroids
- No evidence of AI
- 18 of 19 tested demonstrated normal stress response




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## Methotrexate

- Folate analogue with anti-inflammatory properties
- Inhibition of neovascularization
- Decrease in cytokines (IL-1, IL-8, TNF)
- Conflicting data regarding cessation
  - Grennan, et al. (*Ann Rheum Dis* 2001;60:214-217)
    - 388 patients in 3 groups
    - Lowest infection rate in those who continued MTX
    - Also, fewer flares post-op
  - Potential toxicity if patient develops renal injury or prolonged NPO → give folate

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## Biologic Agents

- TNF- $\alpha$  Antagonists
  - Etanercept (Enbrel), adalimumab (Humira), and infliximab (Remicade)
  - Usual dosing is 2x/week, 1-2 weeks, 4-8 weeks
  - Serious opportunistic infections are known risk, but PJI risk unclear
- IL-1 Antagonist
  - Anakinra (Kineret)
- Limited data regarding cessation
  - 4x risk of PJI

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### 2017 American College of Rheumatology/American Association of Hip and Knee Surgeons Guideline for the Perioperative Management of Antirheumatic Medication in Patients With Rheumatic Diseases Undergoing Elective Total Hip or Total Knee Arthroplasty

Susan M. Goodman,<sup>1</sup> Bryan Springer,<sup>2</sup> Gordon Guyatt,<sup>3</sup> Matthew P. Abdel,<sup>4</sup> Vinod Dasa,<sup>5</sup> Michael George,<sup>6</sup> Ora Gewurz-Singer,<sup>7</sup> Jon T. Giles,<sup>8</sup> Beverly Johnson,<sup>9</sup> Steve Lee,<sup>10</sup> Lisa A. Mandl,<sup>1</sup> Michael A. Mont,<sup>11</sup> Peter Sculco,<sup>1</sup> Scott Sporer,<sup>12</sup> Louis Stryker,<sup>13</sup> Marat Turgunbaev,<sup>14</sup> Barry Brause,<sup>1</sup> Antonia F. Chen,<sup>15</sup> Jeremy Gilliland,<sup>16</sup> Mark Goodman,<sup>17</sup> Arlene Hurley-Rosenblatt,<sup>18</sup> Kyriakos Kirou,<sup>1</sup> Elena Losina,<sup>19</sup> Ronald MacKenzie,<sup>1</sup> Kaleb Michaud,<sup>20</sup> Ted Mikuls,<sup>21</sup> Linda Russell,<sup>1</sup> Alexander Sah,<sup>22</sup> Amy S. Miller,<sup>14</sup> Jasvinder A. Singh,<sup>23</sup> and Adolph Yates<sup>17</sup>




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## 2017 ACR / AAHKS Guidelines

| DMARDs: CONTINUE these medications through surgery. | Dosing Interval     | Continue/Withhold |
|---|---------------------|-------------------|
| Methotrexate  | Weekly              | Continue          |
| Sulfasalazine                                       | Once or twice daily | Continue          |
| Hydroxychloroquine                                  | Once or twice daily | Continue          |
| Leflunomide (Arava)                                 | Daily               | Continue          |
| Doxycycline   | Daily               | Continue          |

Continue the current daily dose of glucocorticoids in adult patients with RA, SpA including AS and PSA, or SLE who are receiving glucocorticoids for their rheumatic condition and undergoing THA or TKA, rather than administering perioperative supra-physiologic glucocorticoid doses (so-called “stress dosing”).

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### 2017 ACR / AAHKS Guidelines

| BIOLOGIC AGENTS: STOP these medications prior to surgery and schedule surgery at the end of the dosing cycle. RESUME medications at minimum 14 days after surgery in the absence of wound healing problems, surgical site infection, or systemic infection. | Dosing Interval                          | Schedule Surgery (relative to last biologic agent dose administered) during |
|---|--|---|
| Adalimumab (Humira)   | Weekly or every 2 weeks                  | Week 2 or 3   |
| Etanercept (Enbrel)   | Weekly or twice weekly                   | Week 2  |
| Golimumab (Simpsoni)  | Every 4 weeks (SQ) or every 8 weeks (IV) | Week 5<br>Week 9  |
| Infliximab (Remicade)   | Every 4, 6, or 8 weeks                   | Week 5, 7, or 9   |
| Abatacept (Orencia)   | Monthly (IV) or weekly (SQ)              | Week 5<br>Week 2  |
| Certolizumab (Cimzia)   | Every 2 or 4 weeks                       | Week 3 or 5   |
| Rituximab (Rituxan)   | 2 doses 2 weeks apart every 4-6 months   | Month 7   |
| Tocilizumab (Actemra)   | Every week (SQ) or every 4 weeks (IV)    | Week 2<br>Week 5  |
| Anakinra (Kineret)  | Daily                                    | Day 2   |
| Secukinumab (Cosentyx)  | Every 4 weeks                            | Week 5  |
| Ustekinumab (Stelara)   | Every 12 weeks                           | Week 13   |
| Belimumab (Benlysta)  | Every 4 weeks                            | Week 5  |
| Tofacitinib (Xeljanz): STOP this medication 7 days prior to surgery.  | Daily or twice daily                     | 7 days after last dose  |

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### 2017 ACR / AAHKS Guidelines

| SEVERE SLE-SPECIFIC MEDICATIONS: CONTINUE these medications in the perioperative period. | Dosing Interval         | Continue/Withhold |
|--|-------------------------|-------------------|
| Mycophenolate mofetil  | Twice daily             | Continue          |
| Azathioprine   | Daily or twice daily    | Continue          |
| Cyclosporine   | Twice daily             | Continue          |
| Tacrolimus   | Twice daily (IV and PO) | Continue          |
| NOT-SEVERE SLE: DISCONTINUE these medications 1 week prior to surgery                    | Dosing Interval         | Continue/Withhold |
| Mycophenolate mofetil  | Twice daily             | Withhold          |
| Azathioprine   | Daily or twice daily    | Withhold          |
| Cyclosporine   | Twice daily             | Withhold          |
| Tacrolimus   | Twice daily (IV and PO) | Withhold          |

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- ### Cardiac issues
- Myocardial infarction
  - Atrial fibrillation
  - Issues mostly related to anticoagulation, hematomas, wound healing problems, and transfusions
  - Avoid therapeutic anticoagulation or aggressive bridging therapy

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High complication rate after total knee and hip replacement due to perioperative bridging of anticoagulant therapy based on the 2012 ACCP guideline  
Arch Orthop Trauma Surg 2014

- Mitral valve, mechanical aortic valve, recent stroke or TIA, A. Fib with CHADS2 5-6, recent VTE or recurrent VTE
- Therapeutic LMWH pre-op and post-op on POD1
- 92% incidence (12/13) of bleeding complications in patients receiving LMWH bridging
- 69% developed an hematoma
- 15% prosthetic joint infection
- Guidelines now modified to reflect bleeding risk



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### Transplant Patients

- At high risk for AVN from corticosteroids and osteoporosis
- Chronic immunosuppression
- Avoid sirolimus (Rapamycin) due to inhibition of fibroblasts
- JOA Vol. 27 No. 6 2012 – Cardiac Transplants
  - No infections in 9 patients with 18 TJRs
- JOA 29 (2014) 11–15 – Lung Transplants
  - 1 late infection in 14 patients with 20 primary TJA

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### Complications of hip and knee joint replacement in solid-organ transplant patients.

*J Surg Orthop Adv. 2013 Fall;22(3):204-12.*  
Angermeier EW, Demos HA, Schutte HD, Barfield WR, Leddy LR.

- 68 patients with 94 TJA from 1995-2008
- 6.5% deep infection in transplant patients vs. 1.9% overall
- All were in diabetic patients
- Superficial infections in 5.1%
- Overall revision rate 13%
- DVT 3.4% / PE 1.7%

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### Chronic Kidney Disease

- No difference in infection risk between stages 1&2 and Stage 3 CKD – 3.5%
- Stage 4&5
  - 74% hemorrhage
  - 13-33% infections
  - 35% loosening
  - Up to 29% surgery-related mortality

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### Inpatient Mortality and Morbidity for Dialysis-Dependent Patients Undergoing Primary Total Hip or Knee Arthroplasty JBJS 2015;97:1326-32

- National Inpatient Sample
- 2934 dialysis-dependent patients (2000-2009) compared with 6.19M non-dialysis patients
- THA – Independent risk factor for mortality and complications:
  - 1.88% mortality vs. 0.13%
  - 9.98 % complications vs. 4.97%
- TKA - Independent risk factor for mortality and complications:
  - 0.92% mortality vs. 0.10%
  - 12.48% complications vs. 5.00%
- Longer LOS, higher transfusion rates, hematomas, cardiac, urinary, and pulmonary complications
- "Arthroplasty should be approached with caution and preferably should be delayed until after renal transplantation."

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### HIV

- 1.5 million people in US
- Increasing numbers of TJA – frequently due to AVN
- CD4 < 200 /  $\mu$ L or viral load >10K / mL at higher risk of wound healing issues / infection
- JOA 29 (2014) 277–282
  - 9.1% PJI in HIV vs. 2.2% in non-HIV
  - No association with low CD4
- JOA 28 (2013) 1254–1258
  - 4.4% PJI in HIV vs. 0.72% in controls
  - 6.22x odds ratio (not significant)
  - No correlation with CD4

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### HIV Infection and Hip and Knee Arthroplasty

JBJS REVIEWS 2017;5(9)

- Systematic review of 6,516,186 joints in 21 studies
- 7.6% complications (RR=2.28)
- Could not analyze infection rate
- No change in survivorship
- "Safe procedures with acceptable outcomes"

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### Hemophilia

- High association with HIV
  - No change in outcome
- 13-15% infection at 5 years
- Frequent *Staph epi* - ? IV factor infusions
- No association with hematoma formation in some studies

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### MRSA Colonization

- 27% of PJI in 1999 → 62% in 2006
- 30% *S. Aureus* carriers in nares
  - 2-9x more likely to develop *S. aureus* SSI
  - Isolates match 80-85% of time
- Screen at pre-op visit
- Decolonize
  - Mupirocin to nares
  - Chlorhexidine shower
- Adjust antibiotics
  - Add Vancomycin 15mg/kg started in holding and completed prior to beginning of procedure
  - Continue Cefazolin 2 or 3 grams at time of "time-out" – After positioning, immediately before handwashing
- Contact isolation

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## Sickle-cell disease

- Screen for skin ulcerations and osteomyelitis
- Multidisciplinary approach
- Avoid crisis
  - Avoid acidosis
  - Fluid resuscitation
  - Oxygenation
  - Transfusions
- Pain management
- 3%-25% infection in THA
- Culture and continue antibiotics until negative




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## Pre-operative Narcotic Use

- 98% of world narcotic Rx are in North America
- 2.1 million people in US with prescription narcotic substance abuse
- "Opioid use prior to total hip arthroplasty leads to worse clinical outcomes" - *Jt. Outcomes* 2014 Jun; 38(6): 1159-1165.
  - Narcotic group had:
    - Higher daily opioid doses
    - Longer LOS
    - Higher proportion on opioids at 6 weeks and final f/u
    - Lower final Harris Hip Scores
- "Chronic opioid use prior to total knee arthroplasty" - *J Bone Joint Surg Am.* 2011 Nov 2;93(21)
  - Narcotic Group had:
    - Knee Society Score 79 vs. 92
    - 5 Arthroscopic evaluations and 8 revisions for stiffness versus none
    - 10 patients referred for pain management versus one.

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## Preoperative Opioid Misuse is Associated With Increased Morbidity and Mortality After Elective Orthopaedic Surgery

CORR (2015) 473:2402-2412

- Nationwide Inpatient Sample
- Increased inpatient mortality OR, 3.7
- Aggregate morbidity OR, 2.3
- Mental disorder OR, 5.9
- Respiratory failure OR, 3.1
- Surgical site infection OR, 2.5
- Mechanical ventilation OR, 2.3
- Pneumonia OR 2.1
- Myocardial infarction OR 1.9
- Postoperative ileus or other gastrointestinal events OR, 1.4
- Increased risk for prolonged hospital length of stay OR, 2.5
- Nonroutine discharge OR, 2.2
- High-risk opioid users were more likely to be younger males

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### Preoperative Reduction of Opioid Use Before Total Joint Arthroplasty

Nguyen LC, Sing DC, Bozic KJ  
*J.Arthroplasty*. 2016 Sep;31(9 Suppl):282-7

- 41 Patients decreased narcotics >50% compared to no decrease
- Weaned patients had outcomes comparable to non-opioid patients: improved versus non-weaned
  - WOMAC 43.7 vs. 17.8
  - SF12 PCS 10.5 vs. 1.85
  - UCLA Activity Score 1.49 vs. 0

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#### Information Statement

### Opioid Use, Misuse, and Abuse in Orthopaedic Practice

*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.*

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#### Opioid Use before Hip or Knee Surgery Can Mean Trouble

"Doc, I know I need to do the surgery, but can you give me some oxycodone for pain until then? I'll stop once I have the surgery."

This is a common conversation in the office of a joint replacement surgeon. In the past, narcotic medication, commonly known as opioids, were given by physicians hoping to alleviate their patients' pain and suffering. Unfortunately, we have learned that these medications may do more harm than good.

**Opioids are powerful prescription pain-reducing medications that have benefits and potentially serious risks.** Common opioid medications prescribed include oxycodone, hydrocodone, morphine, Norco (acetaminophen/hydrocodone), Vicodin (acetaminophen/hydrocodone), Percocet (acetaminophen/oxycodone), hydromorphone (Dilaudid), and tramadol.

<https://hipknee.aahks.org/opioid-use-before-hip-or-knee-surgery-can-mean-trouble/>

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### Pre-op workup

- Required of all primary and revision TKA, THA, and TSA patients
- 3-4 weeks prior to surgery
- 4 hour process
- Co-managed by Ortho PA and Hospitalist who see every patient
- Patients also seen RN navigator, case management, anesthesia, therapy, lab, DME supplier, research team (PEPPER)
- Consent, H&P, Hospitalist consult, all labs completed
- Cardiology, transplant, pulmonary, hematology, dental, and other consults reviewed or initiated
- Surgery rescheduled as needed

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### Pre-op Conference

- Review and close loop on all THA and TKA cases for the following week
- Surgeons, residents, PA, equipment reps, RN navigator, TJ program director, +/- OR coordinator
- Case discussions regarding workup findings, surgical plan, outstanding issues, equipment needs

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### Weekly Teaching Rounds

- Walking Ortho Unit patient rounding
- MD, PA, TJ program manager, RN navigator, nurse manager, staff nurses, PT, OT, Pharmacy, residents
- See in-patients and have discussions about new or ongoing issues

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