<u>Hip and Knee Arthroplasty:</u> <u>Pre-op Optimization Improves Outcomes</u>

Pre-op Optimization Improves Outcom Harry A. Demos, MD

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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



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

Risk Factors

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

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 acidStem cells / PRP

AAOS American Academy of Orthopaedic Surgeons

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:



MAPTA

Conservative Treatments

- Lateral wedge insoles are <u>not</u> recommended for patients with knee osteoarthritis.
 Strength of Recommendation: Strong
- •

- 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 Recommendatics. 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.
 Turneric •
 - :

•

- Turmeric Ginger extract Glucosamine Chondroitin .
- Vitamin D
 - · Strength of Recommendation: Limited (downgrade)

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)

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.

- Knee osteodim the Source and a section to dools date of an inprove pain and rundown in padelits with
 Knee osteodim the Source mendation: Limited (downgrade)
 FDA-approved laser treatment may be used to improve pain and function in patients with knee
 deteoarthritis
 Strength of Recommendation: Limited (downgrade)
 Accupructure may improve pain and function in patients with knee
 seteed the setemation of the set of the setemation of the setemation of the set of the setemation of the setemation of the set of
- Strength of Recommendation: Limited (downgrade)

Pharmacologic Treatments

- Topical NSAIDs should be used to improve function and quality of life for treatment of osteoarthritis of the knee, when not ٠ 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 <u>not</u> effective at improving pain or function for treatment of osteoarthritis of the knee.
 - · Strength of Recommendation: Strong

Procedural Treatments

- Hyaluronic Acid intra-articular injection(s) is <u>not</u> 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 <u>unclear</u> and requires additional evidence.
 - Strength of Recommendation: Consensus

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 <u>not</u> to use freefloating (un-fixed) interpositional devices in patients with symptomatic medial compartment osteoarthritis of the knee.
 - Strength of Recommendation: Consensus

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

Total Knee Arthroplasty (TKA) Documentation of Medical Necessit Total Hip Arthroplasty (THA) Documentation of Medical Necessity I havely document that I have treated for above patient, and all reasonable comervati control thate disease, which causes significant pairs and influences their function and dry document that I have treated the above patient, and all reasonablec one-reative of their disease which exaces similicant min and influences their function and ne lallar co fpresious ostasto Fistal ferrar fractare, OR my, OR ancy of the pelvicor pro ioues of the hip. OR of the ferrenal head, OR ulippiney of dotal ferrar, provinal this, loss acture of the famoral neck, OR fprevious unicompartnextal loner replacement, OR 1 meetinis of filmer, OR ubular facture, OR n, mahanion, or failure of p col joint disease domontratol by: o X-Ray OR o MBI AND one or more of the below conservao X-Ray OR o MRI analyesk:_____ c physical therapy useof case or walker o weightless continente short(s) $c_{\rm c}$ and more detected (i) $c_{\rm c}$ and $c_{\rm c}$ detected and c detected and cfy that the patient does NOT have any of the following on active infortion of the knowlpion, OR active systemic bacteromia, OR active systemic bacteromia, OR pathic arthriais, OR Projecture

IS THE BENEFIT Really worth The Risk?	

TJ Benefits

- · Pain relief
- Improved function
- Return to ADLs
- Improved quality of life
- Return to productive
- employment · Discontinuation of
- assistive devices •
- Correction of deformity
- · Correction of contractures



- Pain •
- Diminished function • Temporary loss of independence
- Time away from work
- Need for assistive devices
- Financial burden .
 - Complications mplications infection, blood clots, pulmonary embolism, perioperative death, cardiovascular problems, medical issues, anesthetic related issues, continued pain, failure of the implants, fractures, loosening, dislocation, leg length differences, damage to nerves, blood vessels, tendons, or other soft tissues, etc.

Informed Consent

- "We discussed the surgical procedure, including the anesthetic, the surgical approach, the implants to be used, the hospitalization, and the post-op rehabilitation. Models of the implants were available in the office to assist with patient education. The benefits of joint the office to assist with patient education. The benefits of joint replacement surgery and the potential risks were discussed including, but are not limited to, infection, blood clots, pulmonary embolism, perioperative death, cardiovascular problems, medical issues, anesthetic related issues, failure of the implants, fractures, loosening, dislocation, limb length differences, damage to nerves, blood vessels, tendons, or other soft tissues, and numerous other potential complications both medical and surgical that could exist. No guarantees were given or implied. The patient was also given a copy of our Total Joint Handbook as an educational resource and will participate in our pre-operative education class and workup." participate in our pre-operative education class and workup."
- Imponderables

Complications and Adverse Ever		Table 2	
Complication	nts Following Total Hip Arthroplasty as Developed by The Hip Society Definition of Complication	Complications and Adverse Event Complication	a Following Total Knee Anthropizety as Developed by The Knee Society ^{1A} Definition of Complication
Reading	Postoperative bleeding requiring surgical teatment	Banding	Pastoerative blanding requiring surgical treatment
Nound complication	Falue of wound healing requiring resperation or a change in THA protocol	Wound complication	Falure of example balance requiring requiring reportion or a change in TKA protocol
humboenbolic deease	Symptomatic thromboenbolic event requiring more intensive, nonprophytectic enhousquiant or antithrombolic treatment during the first 3 months following under Total.	Thromboambolic daeaan	Spriptumatic thrumboarduolic event regaring more intensive, narprophylactic anticoopulat or antithrumbotic treatment during the find 3 months after relev TSA.
Neural deficit	Postoperative neural deficit (sensory or motor) related to the index THA	Neural defeit	Positiperative neural deficit (sensory or motor) related to the index TKA
Yasoular injuny	Introperative vascular injury requiring surgical repair, bypass grafting, or sterting (compartment endorme or amputation should be reported)	Vascular injury	 Interpretative vascular injury reguling surgical repair, bypass grafting, or stantin (compartment syndrome or angustate should be reported)
Dislocation/instability	purpartners groups and appartners in appartners in provide a reporting Dislocation of the lemost head out of the acatebulance or recurrent symptomatic sublavation of the hip joint (direction of instability and type of treatment should be recorded.	Medial collateral ligament injury	 Intracpenative or early postoperative medial collateral ligament legary requiring regari, reconstruction, a change in prosthetic constraint, revision surgery, or TOA product)
Periproathetic fracture	Periprochetic fracture of the proximal femur or the acetabulum (intracperative	instability	Symptometic instability reported by the patient and confirmed by lexity on physic examination as defined by The Knee Society Knee Socre
Aductor muscle disruction	feature or postopensitive feature should be recorded, surgical or nonsurgical treatment should be recorded) flumotomatic abductor deviaurcion that was not present before the surgery.	Malalgement	Symptometic mainlighter in ported by the patient and conferred radiographical with angular determity in the contrast plane > 12° from the mechanical acid.
	associated with a positive Trendelenburg sign and use of an ambulatory assist (eg. cane, oxtob, walker) for treatment of timp or weakness (nonsurgical management should be recorded)	(offrees)	United ROM as reported by the patient and demonstrated in a physical examination with extension lended to 19 whost of full extension or families <39° best applicable I prospensions are of median <35°).
Deep periprosihelis joint intection	A deep parproximate, part indication can be depresent when there is a sinual tradi- communication with the proteintees, in a participant is solutionally involves than at later than of the Valence solution work wereast CEB and senses CPP concentrations, where the provide VBC costs, elevated provide VBC processors of processors in the advanced on provident VBC costs, elevated provide VBC processors of processors in the advanced on provident VBC costs, elevated provide VBC processors of processors in the advanced on provident VBC costs, elevated provide VBC processors of processors in the advanced on provident VBC costs, elevated provide VBC processors of processors in the advanced on provident vBC costs, elevated provide VBC processors of processors of pro- tein the processors of processors of the costs of the processors of processors of pro- tein the processors of processors of the costs of the processors of processors of pro- tein the processors of processors of the costs of the processors of processors of pro- tein the processors of the processors of the costs of the processors of processors of the processors	Deap periprositutic joint intection	A new polycostrels jest induction can be diagreed when there is a sinual to communication with the portobanics or a polycopie is basileting output in the least the angular to least and least piles of based hand least of polycost part, or hard in the distances of an other based based and polycost part, or hard in the distances of an other based based and polycost of polycost is the distances of an other based based on polycost provide the distances of an other based and polycost in the distance polycost is the distance of an other based based on the polycost provide the distances and other of an other based based on the based and the distance of based or the tradeball polycost polycost with the distance of based on the based based based based based and the distance of based on the based based based based based based and the distance of based on the based based based based based and the based based based on the based polycost based
Heterologic ossification	Symptomatic heterotopic ossilication at 1 year following surgery associated with stiffness, reduced range of motion, and sadiographic grade of Brooker II or N	Periprosthetic hadure	Pariprosthetic Eachare of the distal formar, proximal tibis, or patella joargical or recrearcical instituent absold be recorded)
Bearing surface wear Detectivitie	Wear of the bearing surface that is symptomatic or requires surgery Escensile Mic lesion adiacent to one of the implants that is >1 on in any one	Extensor mechanism dissiplion	Despition of the extension mechanism (purgical repair and/or extension lag sheal be recorded)
implant loceaning	dmansion or increasing in size on serial adographs/CT implant isosening confirmed intraspensively or identified ratiographically as	Patelofeneral delocation	Delocation of the patella from the lemonal trochies (desction of instability should) monifold.
	a change in implant position or a progressive radiolucent line at the bone-cement or	Tiblefemoral dislocation	Dislocation of the tibiofernoral juint (direction of instability should be recorded)
	bone-implant interface	Bearing surface wear	Wear of the bearing surface symptomatic or requiring responsition
Dup-Imer dissociation	Dissociation of the cup liner from the acetabular cup	Cultodysis	Expansite lyfic lesion adjacent to one of the implants >1 cm in any one dimension
implant fracture	Implant fracture (specific implant should be recorded)	Implant incoming	or increasing in size on serial radiographs/CT Implant loosening continued intrasperatively or identified radiographically as
Resperation	Return to the operating room related to the index THA (reasons for reoperation should be recorded)	inpart topening	Inspace to seeing continued intracportancing or control isotropaphicary as achange in implant position or aprogressive, radiolacent line at the bone center or bone-indiant interface.
Revision	Revision of one or more of the THA implants (acetabular cup, acetabular liner, temoral head, femoral stem)	Implant fracture or tibial insert desociation	Implant hackure or dissociation of the Kisial insert from the Kisial implant
Readmission	Admission to the hospital for any reason during the first 90 days after THA (reasons for admission and relation to index THA should be recorded)	Resperation	Petum to the operating-scon related to the index TKA (reasons for reoperation sheak! to recorded)
Dearth	Death occurring for any reason during the first 90 days following THA (cause of death	Revision	Revision of one or more of the TKA implants (femur. Exis, Ibial insert, patella)
	and relation to index THA should be recorded)	Readmission	Admission/o the hospital for any reason during the Ent (IC days after TKA (reason for admission and relation to index TKA sheald be recorded)
CHP = C-mactive protein, ESH = erythracy Hoad call	yle sadimentation tolo, PMH i polymorphonuclear neutrophil, 1744 i total hip anthroplasty, MBC i white	Death	Death occurring for any reason-during the first 90 days after TKA (cause of deat and relation to index TKA shauld be recorded)

Prosthetic Joint Infections

- 0.25 3% of primary TJA (OA); up to 8% RA
- Up to 6x greater risk for revision TJA
- Expected to reach 6.8% by 2030
- Is rapidly replacing aseptic loosening as most frequent cause of revision
- Mortality 2.7-18%
- Cost of revision \$60K per case
 Costs > \$600 million in US annually
- IM TJA * 1% * \$60K = \$600M
- \$1.62 Billion is current cost estimate











Risk Factors

- Inflammatory Arthritis (2-8%)Diabetes (3.1-13.5%) - Vascular disease
- Diabetes (3.1-10.0%)
 Immunosuppressed
 HIV
 Transplant (10-1)

 - Transplant (10-15%) .
 - Sickle cell disease
 - Medications
- Malnutrition (3-5x higher)
 ASA >3
- -Hemophilia (9-13%)
- _ Malignant tumors
- _
- _
- Tobacco use Renal failure (HD) Dental infections / hygiene •
- Skin infections
- _ Chronic UTI's
- Previous surgeries

- Arterial
 Cardiac
- CardiacVenous stasis
- MRSA Colonization Obesity (6.7x higher THA, 42X for THA) -
- Anticoagulation .
- Atrial fibrillation
- Older patients Low income
- •
- Male gender •
 - Hospital or surgeon with low volume
- . Longer operations (>3 hours)





PJI Risk Assessment

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

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

Evaluation of a Preoperative Optimization Protocol for Primary Hip and Knee Arthroplasty Patents 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

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



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
 - Transfusion 1.19x
 - Death 3.23x
- Hemorrhage 1.99x
- Wound infection 2.28x
- Length of stay 1 day

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



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

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

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

Malnutrition

- Transferrin <200 mg/dl
- Albumin <3.5 g/dl
- Prealbumin
- Total lymphocyte count <1500 cells/mm³
- 5 7x higher risk of major wound complications
- · Longer hospital stays / higher costs
- Consider screening high risk and revisions and use nutritional supplements +/- nutritionist.
- Protein, Vitamin A,C,&D, zinc, copper









Obesity

- 502M obese worldwide
- ½ 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



The Influence of Obesity on the Complication Rate and Outcome of Total Knee Arthroplasty A Meta-Analysis and Systematic Literature Review JBIS 2012;94:1889-44

- · 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



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

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 <u>improvement</u> in scores in morbidly obese
- · Survivorship and and complications similar
- · Slightly higher revision for infection
- « withholding surgery based on the BMI is not justified »

London Health Sciences Centre

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 complicationsMorbid 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



	Contents lists available at ScienceDirect
2-2-2-3	The Journal of Arthroplasty
A. Seller	
ELSEVIER	journal homepage: www.arthroplastyjournal.org
The Fate of N	forbidly Obese Patients With Joint Pain: A
	Study of Patient Outcomes
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	s, Beth Israel Deaconess Medical Center, Boston, MA Surgerie, Medical University of South Carolina College of Medicine, Charleston, SC
Article history: Received 18 December 2020 Received in revised form 13 February 2021 Accepted 24 February 2021	Bargamati, TO sendere if dates pointer selling and give algorithm of the pointer in tensors of bogs/hours and mit constraints in the point point and mit constraints rais a sender and mit To. We might determine the effectiveness of an ethologiest we greaters in the low weight. Models: We admitted models have low points under 1000 (2014-2018 kg/m) and giver does 1000 Models: We admitted models have low points under 1000 (2014-2018 kg/m) and giver does 1000 Models: We admitted models have low points under the sender the
Recepted 24 returning 2021 Available online xxx Reywords: body mass index	Results: Two hundred thirty morbid and 50 super obese patients were identified. Super obese patients

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%

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

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

Jacob C. Balmer, BS'; Ashley B. Anderson, MD²; William R. Barfield, PhD'; Vincent D. Pellegrini, MD'; and Harry A. Demos, MD'

Smokers who undergo total joint arthroplosty (IJA) face increased rates of medical and surgical complications that can be reduced by preventive smoking cessation. We investigated the long-term durubility of presperative smoking cessation among IJA patients. Twenty entities to be very about their preinformative amoking active history of smoking at the prooperative appointment before TJA constent to telephone survey about their preinformative amoking at the prooperative smoking the zr patients, zr (7283) were identified as having qui smoking prior to survey was 3.2 years. Of the zr patients, zr (7283) were identified as having qui smoking prior to surgery. Of these zr patients, to (47263) effector patients to (51000 cm) and additioned from society at the prooperative constelling and a requirement for smoking cessation rates with standard therapies (p < 0.001). Our results suggest that prooperative constelling 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):03-05, 2020)

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

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

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)

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

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)

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
- ٠ 18 of 19 tested demonstrated normal stress response



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

Biologic Agents

- TNF-α 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

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

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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").

2017 ACR / AAHKS Guidelines

BIOLOGIC ACENTS: 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 (Simponi)	Every 4 weeks (SQ) or every 8 weeks (IV)	Week 5 Week 9
Infliximab (Remicade)	Every 4, 6, or 8 weeks	Week 5, 7, or 9
Abatacept (Orencia)	Monthly (IV) or weekly (SQ)	Week 5 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 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

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
	Twice daily (IV and PO)	Withhold

Cardiac issues

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

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

CHEST

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

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%

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

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%
- 1.00% infortantly 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%
 10.5 bicher transfusion acts is such as a supervised of the supervise

- 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."

HIV

- 1.5 million people in US
- Increasing numbers of TJA frequently due to AVN
- CD4 < 200 / μ 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

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"

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

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

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

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" - Int Orthop. 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
- 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.

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

Preoperative Reduction of Opioid Use Before Total Joint Arthroplasty Nguyen LC, Sing DC, Bozic KJ JAttiroplasty, 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

AAOS AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS

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.

Your Complete Guide to Joint Replacement

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

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

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

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