Date/Time: Friday, June 7, 2024 from 3:30 PM – 4:25 PM
Title: Hip and Knee Arthroplasty: Is the Risk Worth the Reward?

Description: Although hip and knee replacement are among the most commonly performed orthopedic procedures and they have beneficial outcomes, achieving these outcomes requires diligent pre, intra, and post-op optimization and management.
The following topics will be discussed in detail in this Session:

- Subjective, objective, and radiographic evaluation of hip and knee arthritis and related conditions.
- Non-operative management of osteoarthritis
- Risk factor identification and modification

Learning Objectives:
At the conclusion of the session participants should be able to:

- Discuss the assessment (including radiograph findings) and treatment of hip and knee osteoarthritis
- Determine whether conservative management or joint replacement is the best option for the patient
- Implement protocols and programs for patient optimization
- Identify important considerations for surgical planning

Hip and Knee Arthroplasty: Is the Risk Worth the Reward?

Harry A. Demos, MD
Department of Orthopaedics and Rehabilitation

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

Goals and Objectives

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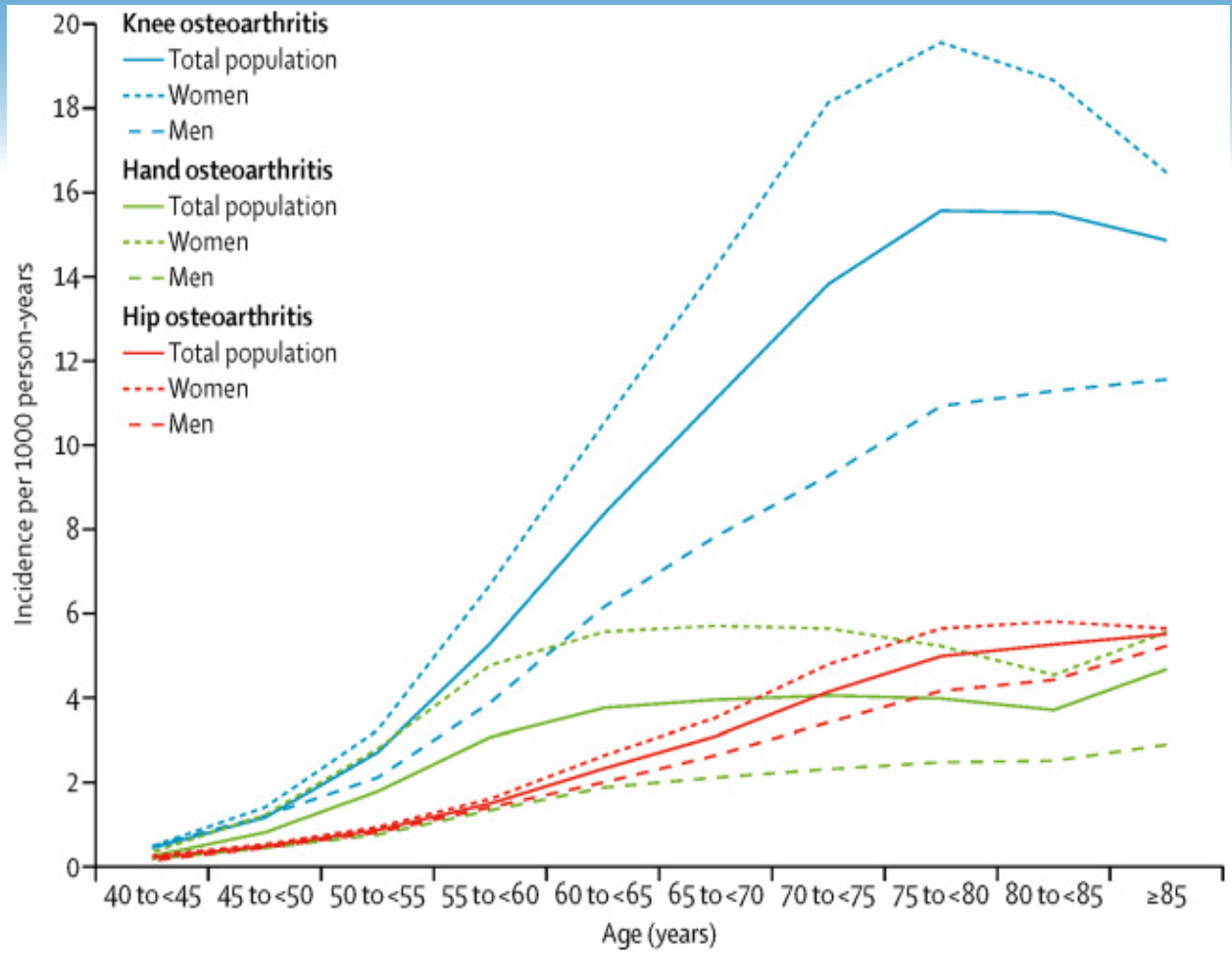
“It’s Just Arthritis”

- 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



The Lancet 393, 2019

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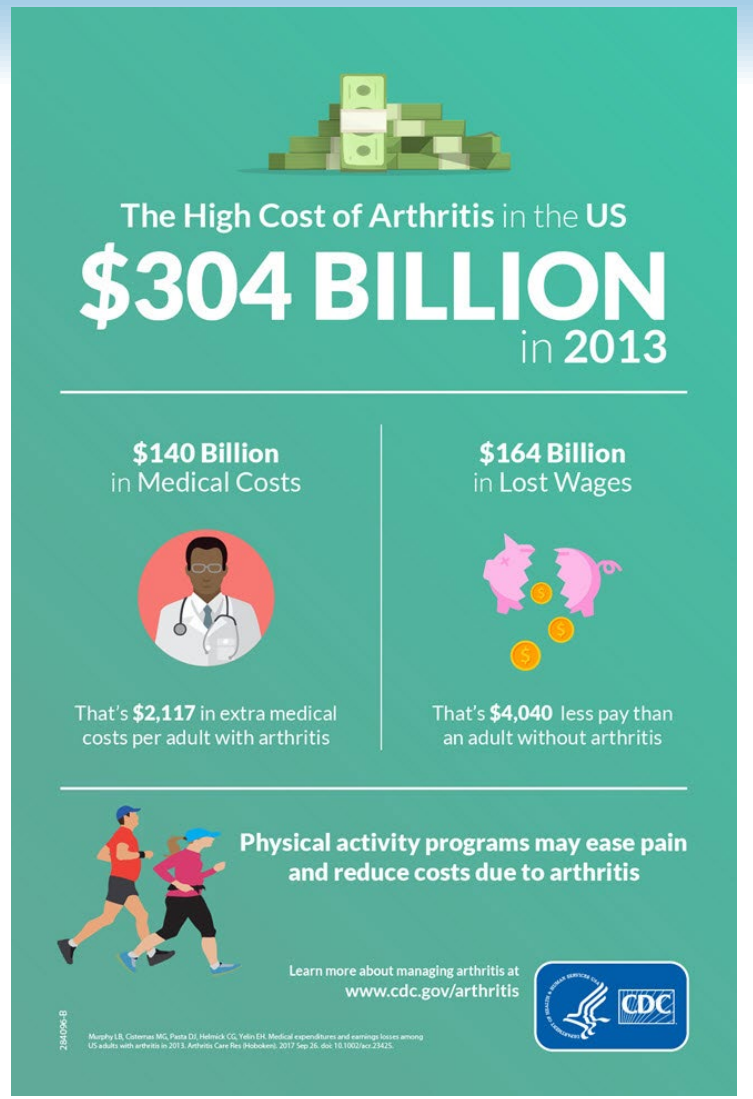
Economic Impact

- 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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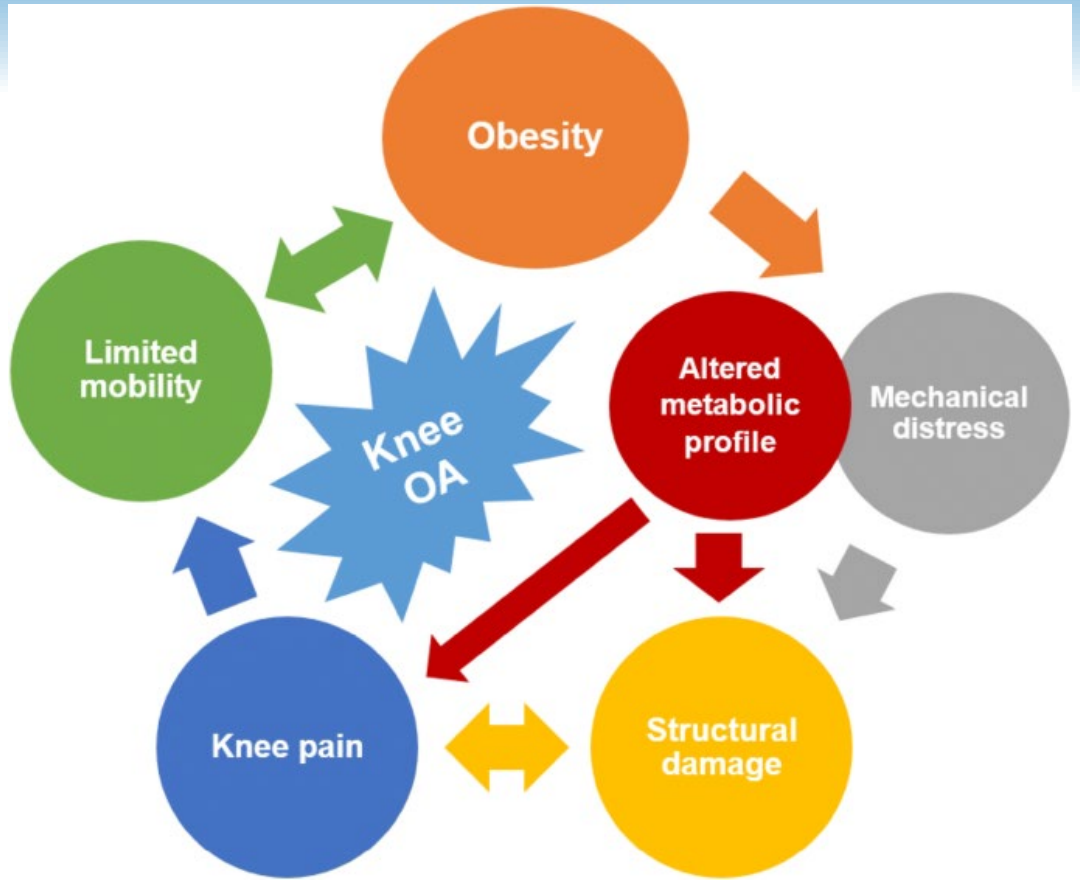
Risk Factors

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



Georgiev, T., Angelov, A.K. Modifiable risk factors in knee osteoarthritis: treatment implications. Rheumatol Int 39, 1145–1157 (2019). https://doi.org/10.1007/s00296-019-04290-z

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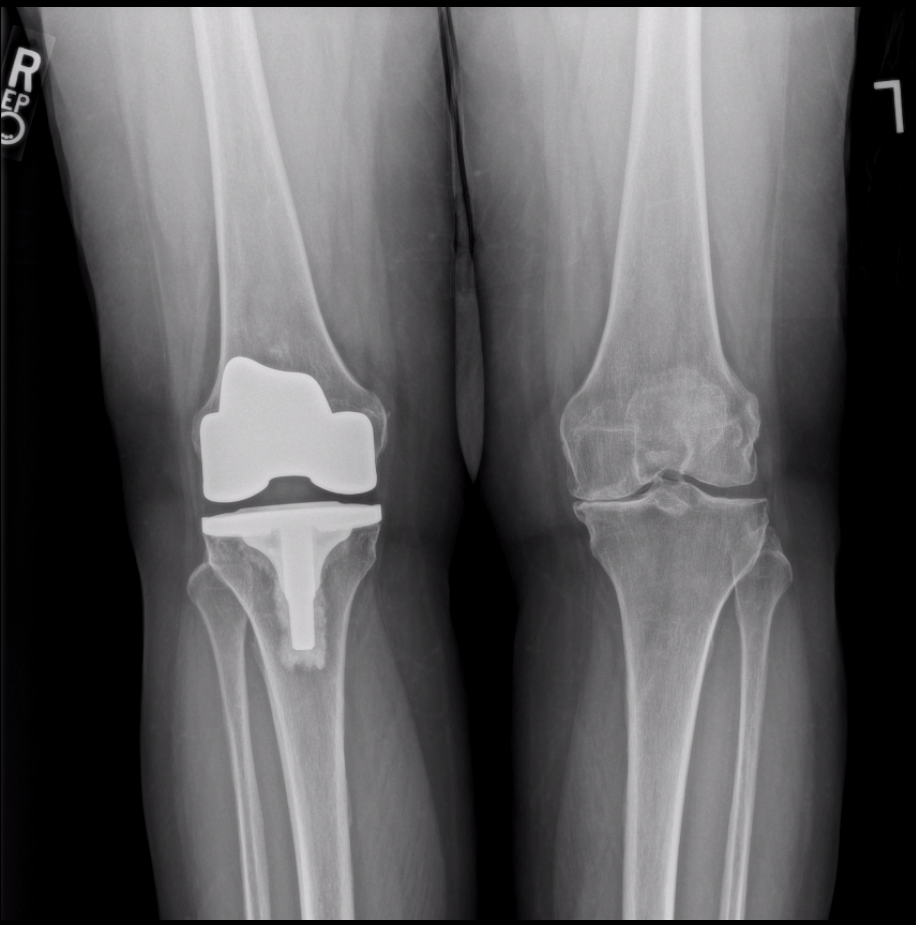
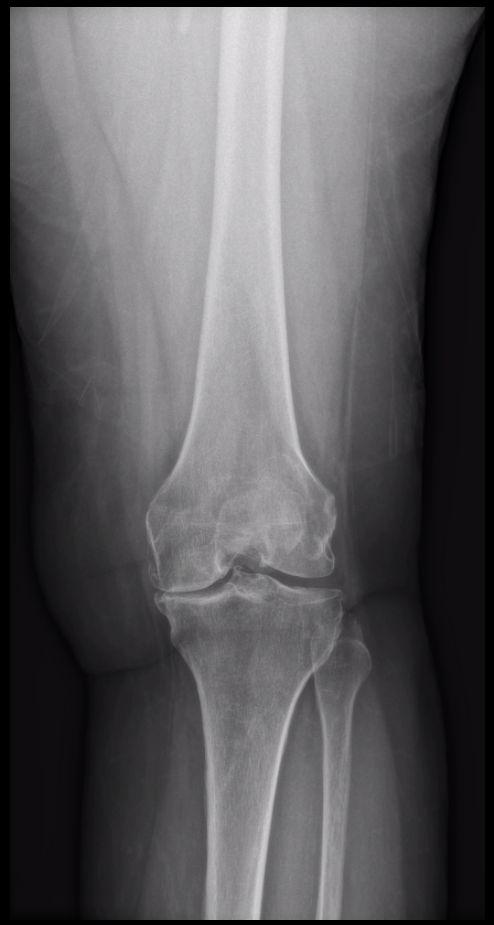
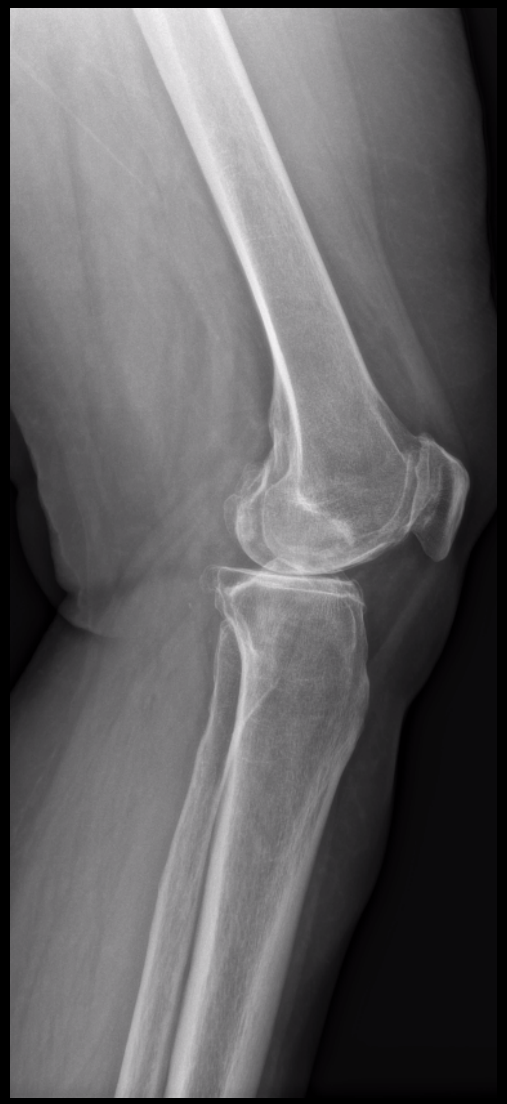
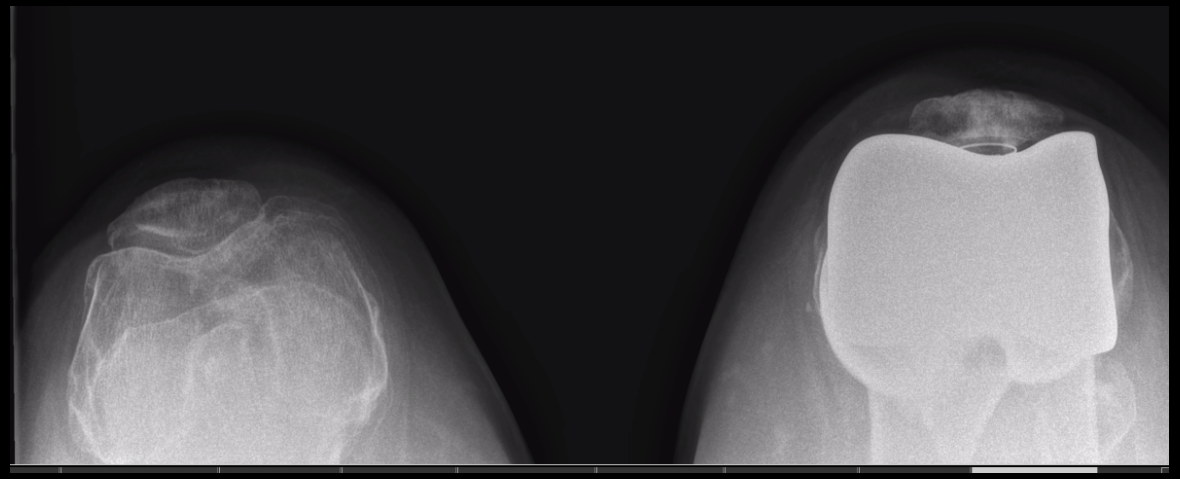
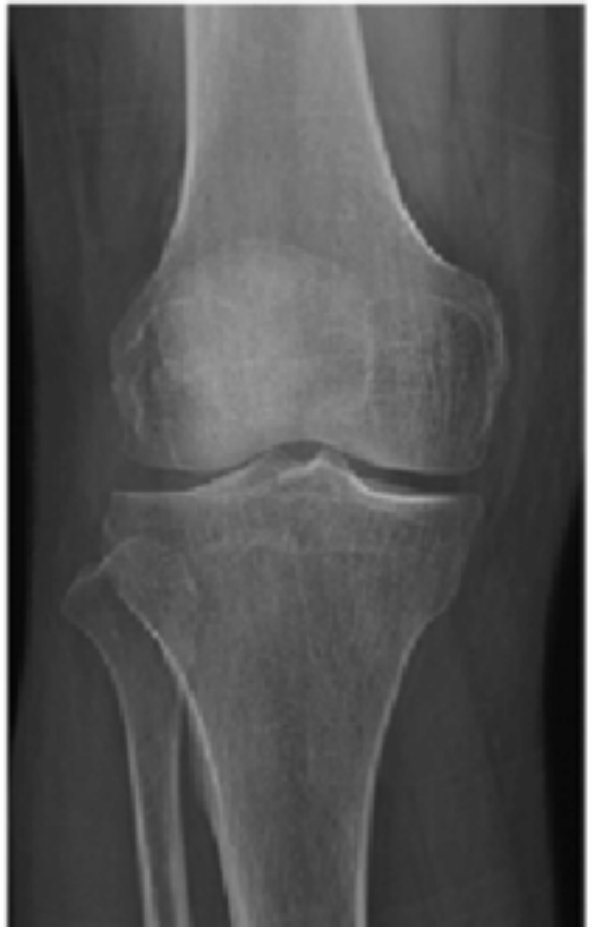
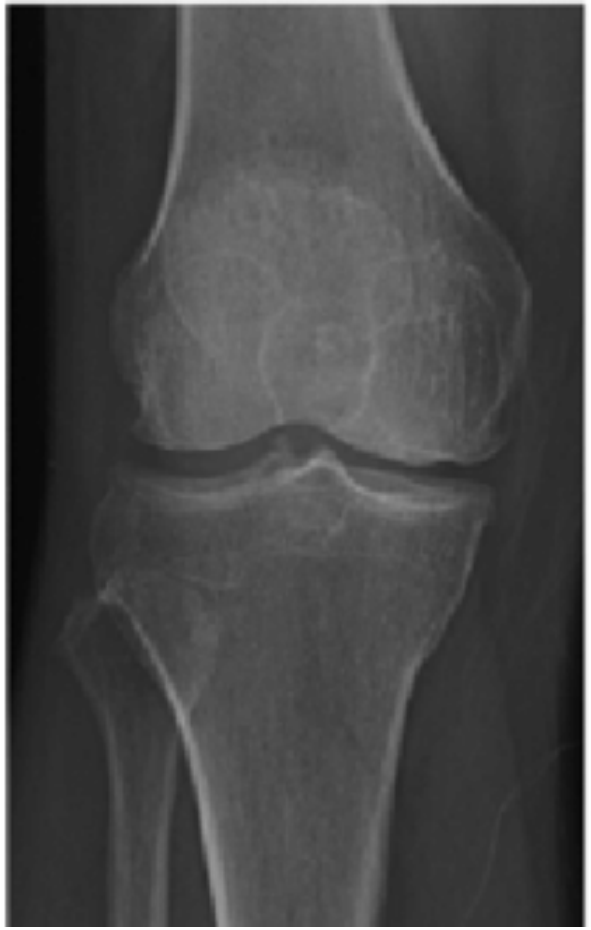





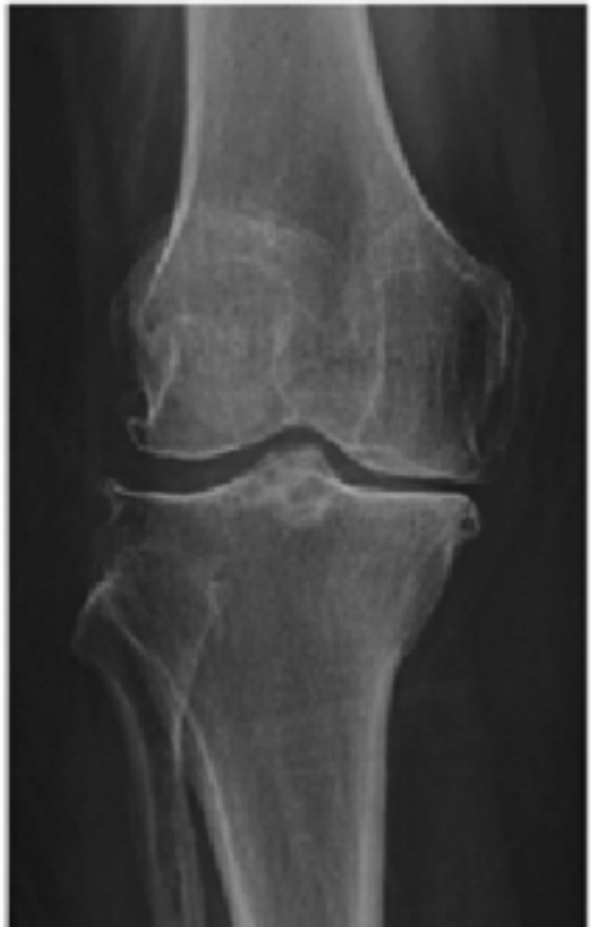
Kellgren and Lawrence Osteoarthritis Scale



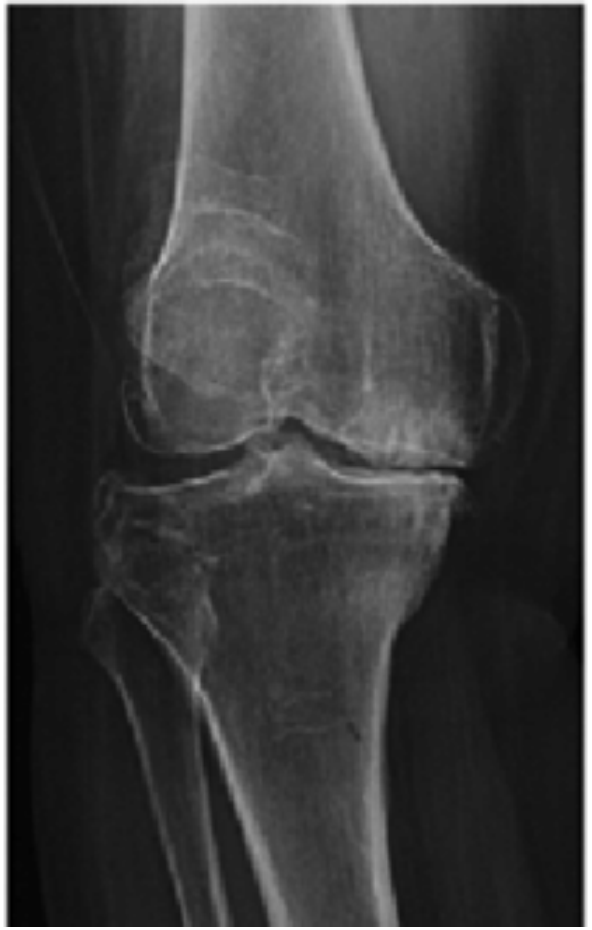
grade 1 (doubtful): doubtful joint space narrowing and possible osteophytic lipping



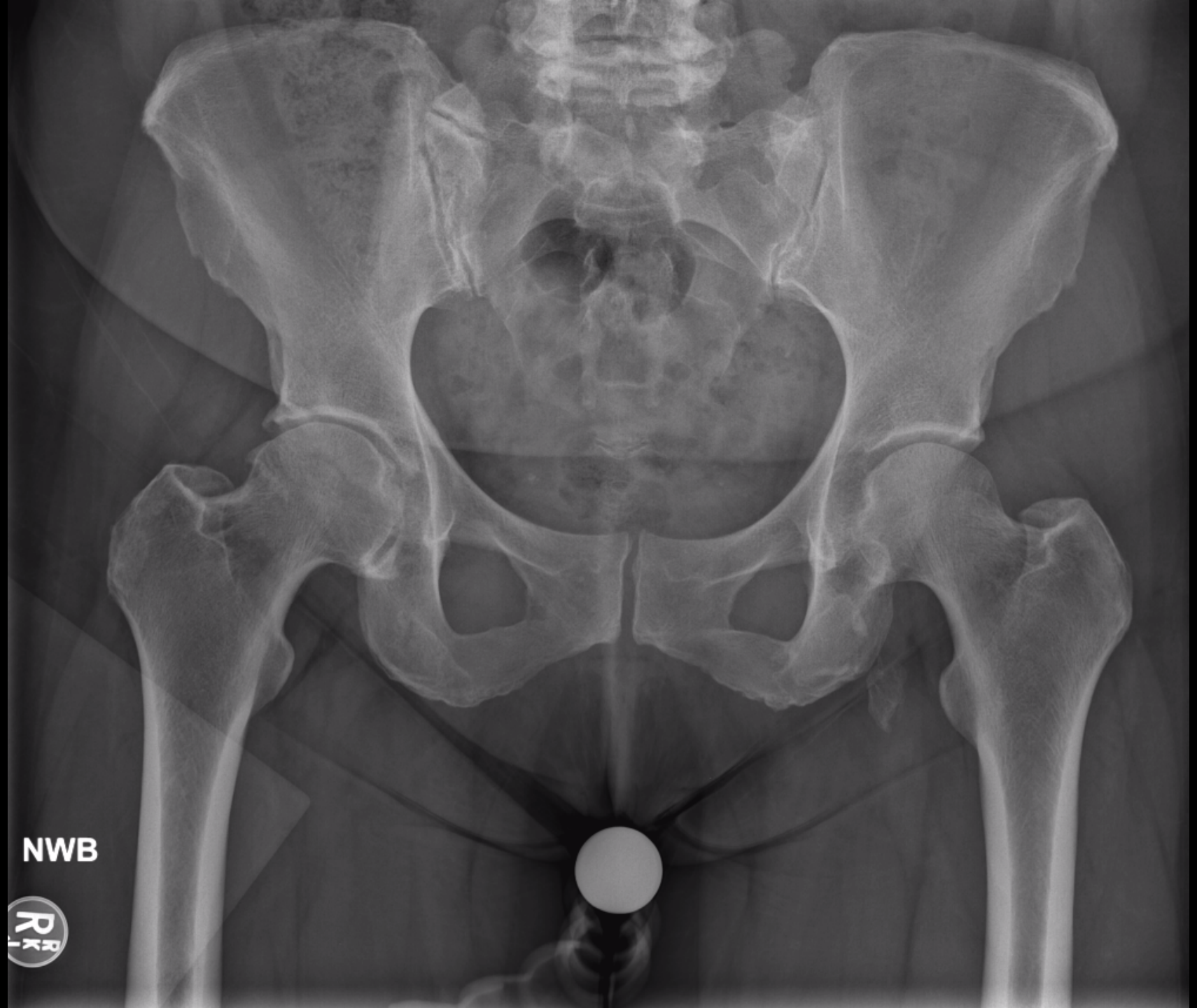
grade 2 (minimal): definite osteophytes and possible joint space narrowing



grade 3 (moderate): moderate multiple osteophytes, definite narrowing of joint space, some sclerosis and possible deformity of bone ends



grade 4 (severe): large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone ends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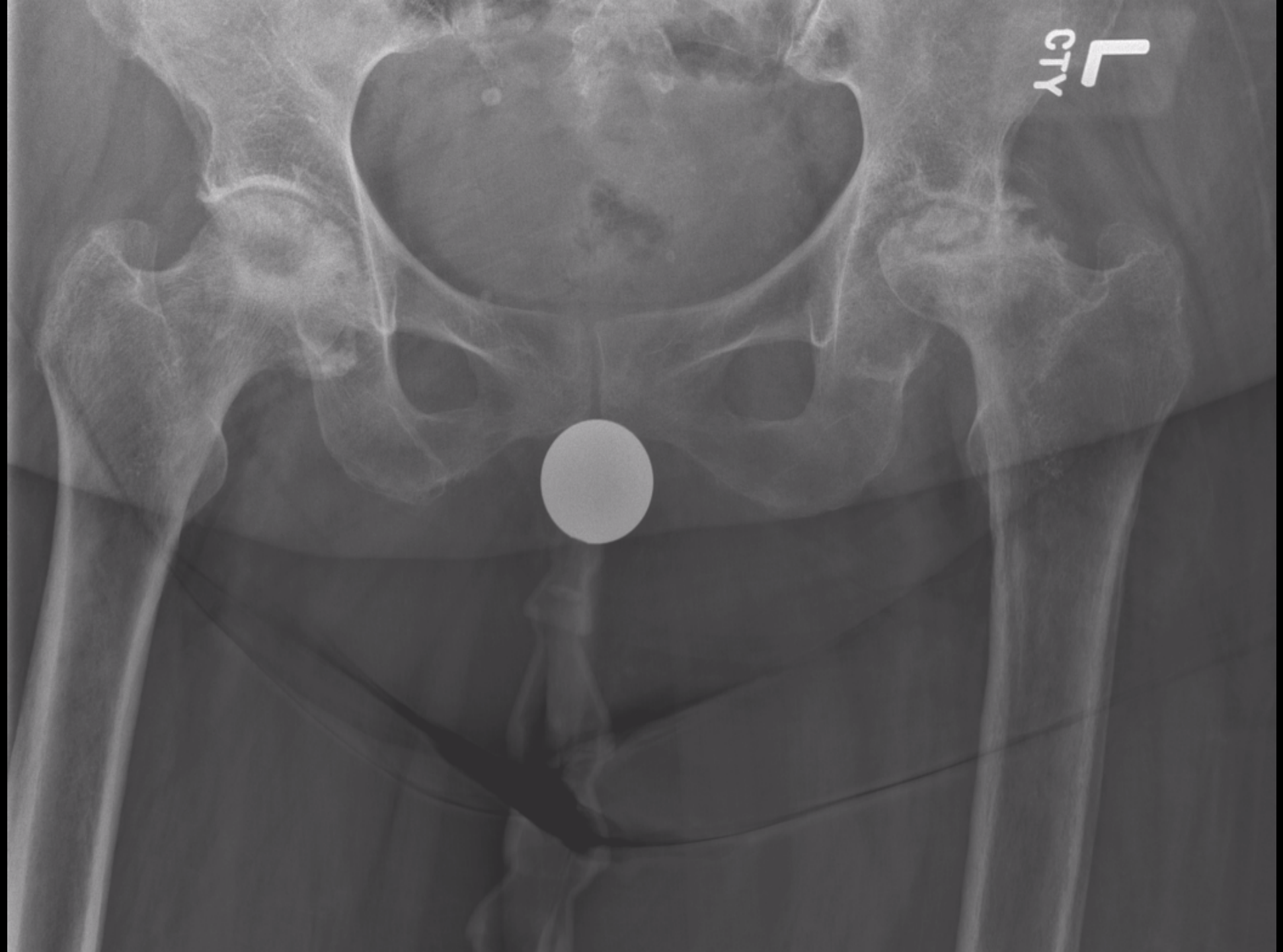
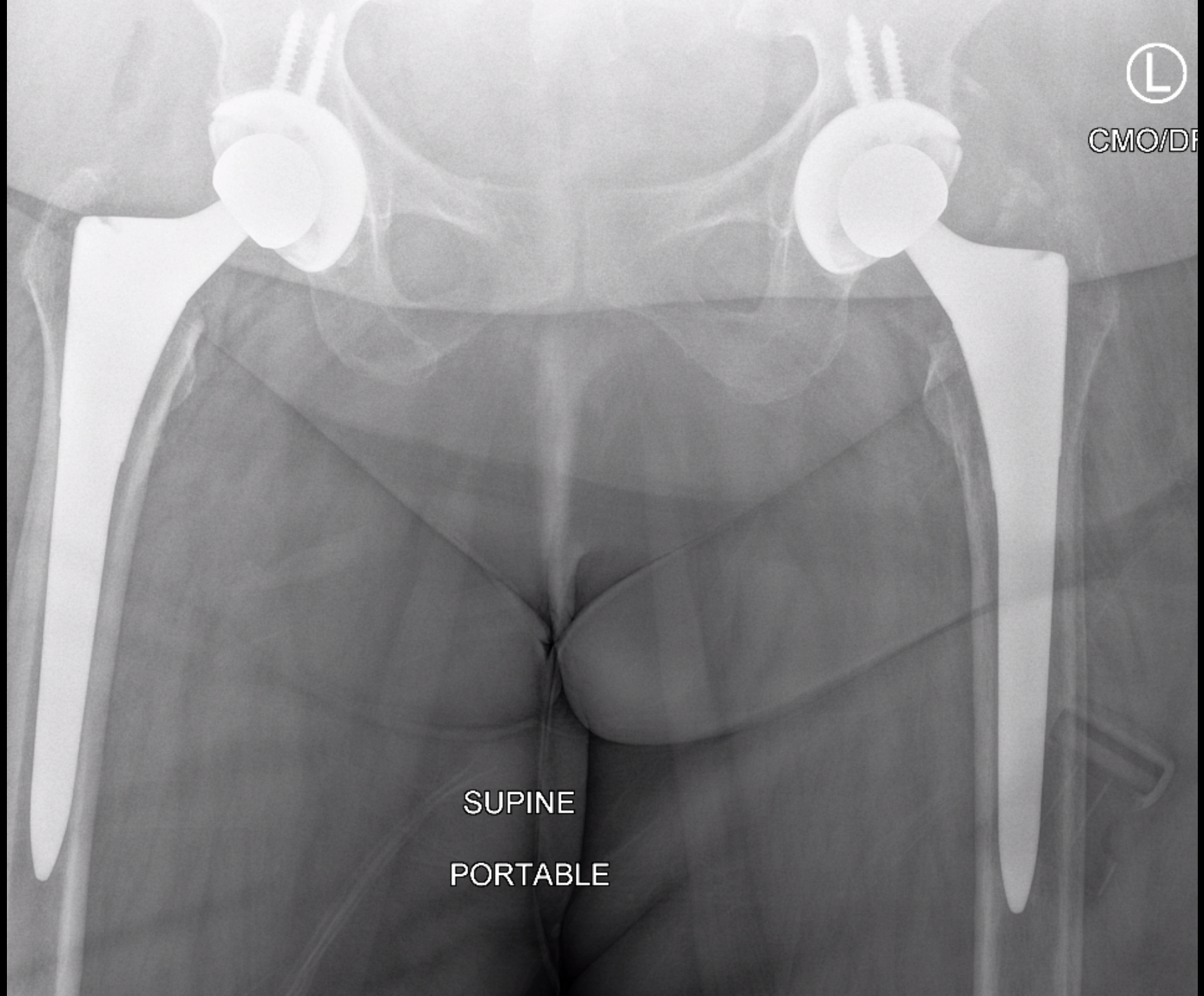

CTY


L
CMO/DR
SUPINE
PORTABLE

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

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:

AAHKS
American Association of Hip and Knee Surgeons

APTA
American Physical Therapy Association

MUSC
Medical University of South Carolina

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)

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.
  - 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)

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

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

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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American Academy of Orthopaedic Surgeons

Management of Osteoarthritis of the Hip

Evidence-Based Clinical Practice Guideline

Adopted by:
The American Academy of Orthopaedic Surgeons Board of Directors

December 1, 2023

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AAOS CPG Hip OA 2023

PHYSICAL THERAPY AS CONSERVATIVE TREATMENT

Physical therapy could be considered as a treatment for patients with mild to moderate symptomatic osteoarthritis of the hip to improve function and reduce pain.

Quality of Evidence: High

Strength of Recommendation: Moderate ★★★☆ (Downgraded)

Evidence from two or more "High" quality studies with consistent findings for recommending for or against the intervention. Recommendation was downgraded based on EtD framework.

- Disagreement among the studies as to whether supervised physical therapy was superior to control groups
- No studies that found that physical therapy resulted in worse outcomes.
- Unclear if physical therapy is beneficial for all patients, or just those earlier in the course of osteoarthritis
- Possible that patients with end-stage disease may not receive functional benefit from physical therapy, despite the cost and time associated with rehabilitation.

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INTRAARTICULAR CORTICOSTEROID INJECTION

Intraarticular corticosteroids could be considered to improve function and reduce pain in the short-term for patients with symptomatic osteoarthritis of the hip.

Quality of Evidence: High

Strength of Recommendation: Moderate ★★★☆ (Downgraded)

Evidence from two or more "High" quality studies with consistent findings for recommending for or against the intervention. Recommendation was downgraded based on EtD framework.

- Downgraded to moderate for several reasons including heterogeneity in study design and corticosteroid dosing as well as a lack of reporting of adverse events (e.g., infection, rapidly progressive osteoarthritis of the hip)
- While intraarticular corticosteroids can improve pain and function in the short-term for patients with symptomatic osteoarthritis of the hip, there are risks with their use

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INTRAARTICULAR HYALURONIC ACID

Intraarticular hyaluronic acid should not be considered for treatment of symptomatic osteoarthritis of the hip as it does not improve function or reduce pain better than placebo.

Quality of Evidence: High

Strength of Recommendation: Strong ★★★★

Evidence from two or more "High" quality studies with consistent findings for recommending for or against the intervention. Also requires no reasons to downgrade from the EtD framework.

- Five high quality studies (Nouri 2022, Brander 2019, Qvistgaard 2006, Richette 2009, Atchia 2011) compared intraarticular (IA) hyaluronic acid (HA) with placebo.
- All five showed no improvement in pain or function with IA hyaluronic acid compared to placebo

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PHARMACOLOGICAL MANAGEMENT: NSAIDs

When not contraindicated, oral nonsteroidal anti-inflammatories (NSAIDs) should be used to reduce pain and improve function in the treatment of symptomatic hip osteoarthritis.

Quality of Evidence: High

Strength of Recommendation: Strong ★★★★

Evidence from two or more "High" quality studies with consistent findings for recommending for or against the intervention. Also requires no reasons to downgrade from the EtD framework.

- Five studies (three moderate quality and two high quality) compared oral nonsteroidal anti-inflammatories (NSAIDs) with placebo for treatment of symptomatic osteoarthritis of the hip and showed improvement in pain and function scores with NSAIDs
- Compared to placebo, all five studies reported on pain and uniformly reported improvement in pain with the use of oral NSAIDs
- Three articles compared efficacy of a NSAIDs against each other:
  - Schnitzer (2011) found that lumiracoxib showed similar efficacy to celecoxib
  - Kivitz (2001) found that celecoxib 200mg/day and 400mg/day showed similar efficacy to naproxen
  - Makarowski (2002) reported similar efficacy between valdecoxib 10mg and naproxen
- The use of non-opioid medications such as NSAIDs for nonoperative treatment of symptomatic osteoarthritis of the hip is extremely important to minimize the use of opioids

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PHARMACOLOGICAL MANAGEMENT: ACETAMINOPHEN

In the absence of sufficient evidence, it is the opinion of the workgroup that when not contraindicated, oral acetaminophen may be considered to improve pain and function in the treatment of symptomatic osteoarthritis of the hip.

Quality of Evidence: Consensus

Strength of Option: Consensus ★☆☆☆

There is no supporting evidence, or limited level evidence was downgraded due to major concerns addressed in the EtD framework. In the absence of reliable evidence, the guideline work group is making a recommendation based on their clinical opinion.

High quality evidence that oral acetaminophen improves pain and function for patients with osteoarthritis of the **knee**

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PRESCRIPTION OPIOID AS CONSERVATIVE TREATMENT

In the absence of sufficient evidence, it is the opinion of the workgroup that oral opioids not be utilized for nonoperative treatment of symptomatic osteoarthritis of the hip.

Quality of Evidence: Consensus

Strength of Option: Consensus ★☆☆☆

There is no supporting evidence, or limited level evidence was downgraded due to major concerns addressed in the EtD framework. In the absence of reliable evidence, the guideline work group is making a recommendation based on their clinical opinion.

- High quality evidence that oral opioids, 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**
- Preoperative opioid use is associated with increased risks of adverse events, complications, and revision in total hip arthroplasty
- Patients who wean their opioid use before total hip arthroplasty have significant improvements in clinical outcomes after surgery compared to patients who continue their opioid use up until surgery

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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

Total Hip Arthroplasty (THA) Documentation of Medical Necessity

Patient Name: _____

I hereby document that I have treated the above patient, and all reasonable conservative treatments have failed to control their disease, which causes significant pain and influences their function and now requires THA.

Indication:

□ malignancy of the pelvis or proximal femur or soft tissues of the hip, OR

□ avascular necrosis of the femoral head, OR

□ fracture of the femoral neck, OR

□ acetabular fracture, OR

□ nonunion, malunion, or failure of previous hip fracture surgery, OR

□ advanced joint disease demonstrated by:

□ X-Ray OR □ MRI

AND

one or more of the below conservative treatments have been tried and failed for 3months or more:

□ anti-inflammatory medication : _____

□ analgesic: _____

□ home exercise □ physical therapy

□ use of cane or walker □ weight loss

□ cortisone shot(s)

I also certify that the patient does NOT have any of the following **contraindications** to THA:

- active infection of the hip joint, OR
- active systemic bacteremia, OR
- active skin infection or open wound at surgical site, OR
- neuropathic arthritis, OR
- severe, rapidly progressive neurological disease, OR
- severe medical condition that makes risks of the surgery outweigh the potential benefit.

Physician: _____ Physician Signature: _____ Date: _____

Total Knee Arthroplasty (TKA) Documentation of Medical Necessity

Patient Name: _____

I hereby document that I have treated the above patient, and all reasonable conservative treatments have failed to control their disease, which causes significant pain and influences their function and now requires TKA.

Indication:

□ failure of previous osteotomy, OR

□ distal femur fracture, OR

□ malignancy of distal femur, proximal tibia, knee joint, soft tissues, OR

□ failure of previous unicompartmental knee replacement, OR

□ avascular necrosis of knee, OR

□ advanced joint disease demonstrated by:

□ X-Ray OR □ MRI

AND

one or more of the below conservative treatments have been tried and failed for 3months or more:

□ anti-inflammatory medication : _____

□ analgesic: _____

□ home exercise □ physical therapy

□ use of cane or walker □ weight loss

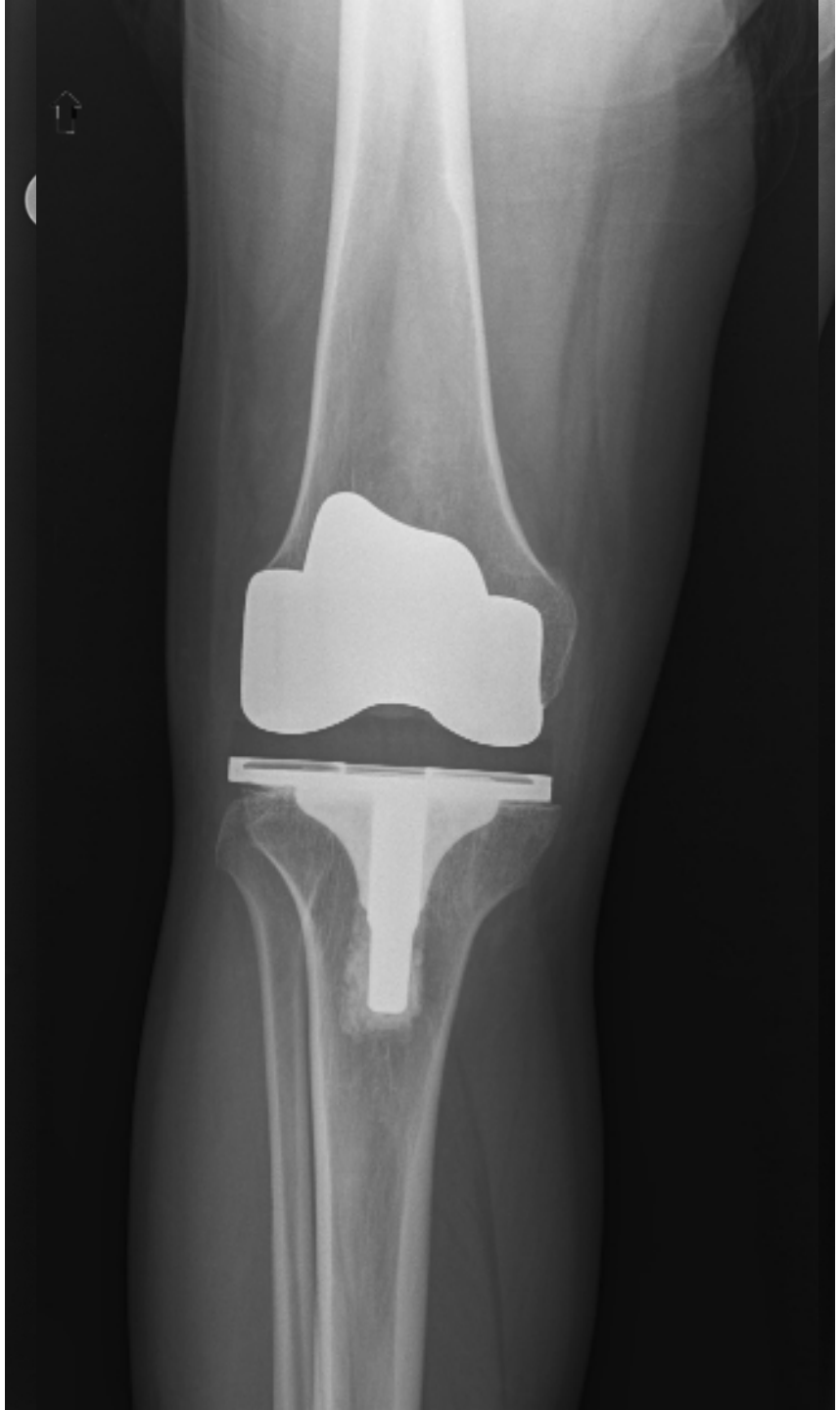
□ brace □ cortisone shot(s)

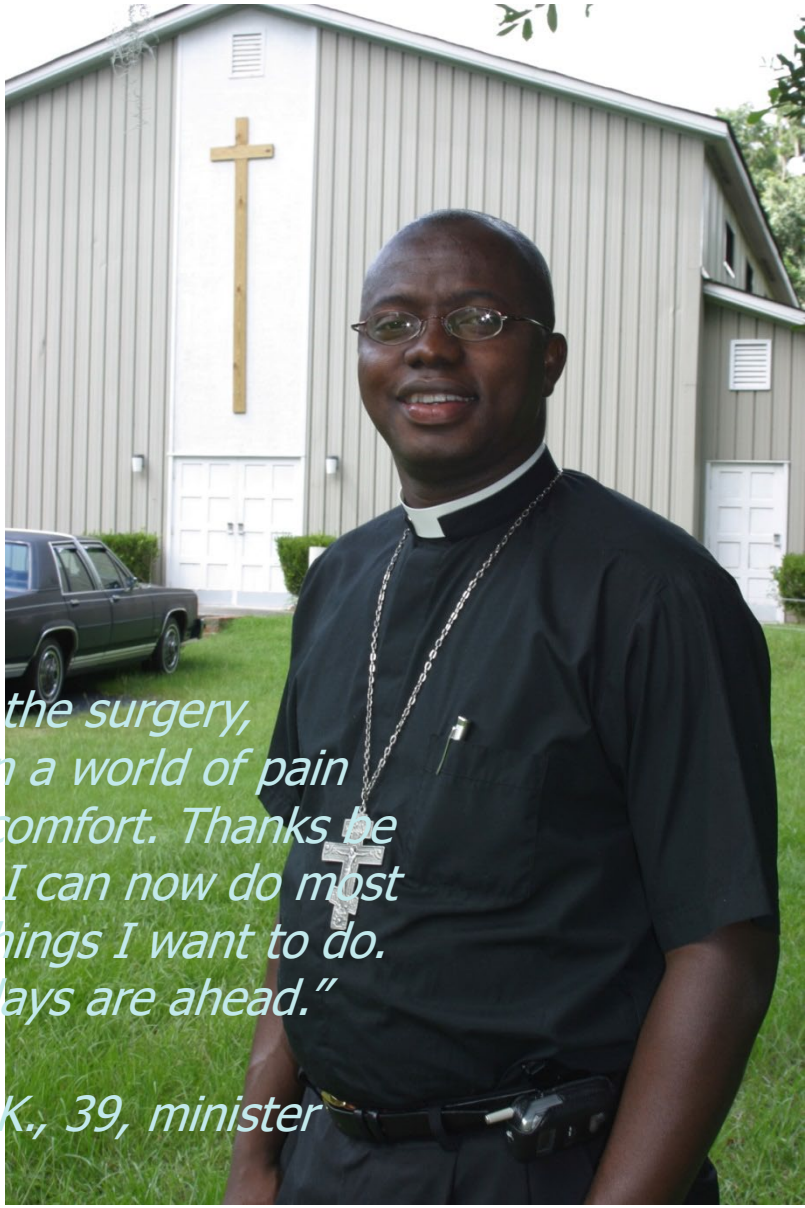
□ supartz, synvisc, hyalagan, orthovisc, euflexxa

I also certify that the patient does NOT have any of the following **contraindications** to TKA:

- active infection of the knee joint, OR
- active systemic bacteremia, OR
- active skin infection or open wound at surgical site, OR
- neuropathic arthritis, OR
- severe, rapidly progressive neurological disease, OR
- severe medical condition that makes risks of the surgery outweigh the potential benefit.

Physician: _____ Physician Signature: _____ Date: _____





"Before the surgery, I lived in a world of pain and discomfort. Thanks be to God, I can now do most of the things I want to do. Better days are ahead."

– Fr. A. K., 39, minister

“My pain is not bad, but I know it will get worse, so I want to have it done now”

OR

“I should wait until I am crippled before I have a joint replacement”

PROs – Oxford Knee Score

PROBLEMS WITH YOUR KNEE

During the past 4 weeks.. ✓tick one box for every question

1 *During the past 4 weeks.....*
How would you describe the pain you usually have from your knee?

None	Very mild	Mild	Moderate	Severe
❑	❑	❑	❑	❑

2 *During the past 4 weeks.....*
Have you had any trouble with washing and drying yourself (all over) because of your knee?

No trouble at all	Very little trouble	Moderate trouble	Extreme difficulty	Impossible to do
❑	❑	❑	❑	❑

3 *During the past 4 weeks.....*
Have you had any trouble getting in and out of a car or using public transport because of your knee? (whichever you would tend to use)

No trouble at all	Very little trouble	Moderate trouble	Extreme difficulty	Impossible to do
❑	❑	❑	❑	❑

4 *During the past 4 weeks.....*
For how long have you been able to walk before pain from your knee becomes **severe**? (*with or without a stick*)

No pain/ More than 30 minutes	16 to 30 minutes	5 to 15 minutes	Around the house only	Not at all - pain severe when walking
❑	❑	❑	❑	❑

5 *During the past 4 weeks.....*
After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your knee?

Not at all painful	Slightly painful	Moderately painful	Very painful	Unbearable
❑	❑	❑	❑	❑

6 *During the past 4 weeks.....*
Have you been limping when walking, because of your knee?

Rarely/ never	Sometimes, or just at first	Often, not just at first	Most of the time	All of the time
❑	❑	❑	❑	❑

During the past 4 weeks... ✓tick one box for every question

7 *During the past 4 weeks.....*
Could you kneel down and get up again afterwards?

Yes, Easily	With little difficulty	With moderate difficulty	With extreme difficulty	No, Impossible
❑	❑	❑	❑	❑

8 *During the past 4 weeks.....*
Have you been troubled by pain from your knee in bed at night?

No nights	Only 1 or 2 nights	Some nights	Most nights	Every night
❑	❑	❑	❑	❑

9 *During the past 4 weeks.....*
How much has pain from your knee interfered with your usual work *(including housework)*?

Not at all	A little bit	Moderately	Greatly	Totally
❑	❑	❑	❑	❑

10 *During the past 4 weeks.....*
Have you felt that your knee might suddenly 'give way' or let you down?

Rarely/ never	Sometimes, or just at first	Often, not just at first	Most of the time	All of the time
❑	❑	❑	❑	❑

11 *During the past 4 weeks.....*
Could you do the household shopping on your own?

Yes, Easily	With little difficulty	With moderate difficulty	With extreme difficulty	No, Impossible
❑	❑	❑	❑	❑

12 *During the past 4 weeks.....*
Could you walk down one flight of stairs?

Yes, Easily	With little difficulty	With moderate difficulty	With extreme difficulty	No, Impossible
❑	❑	❑	❑	❑

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

TJ Risks

Pain

Diminished function

Temporary loss of independence

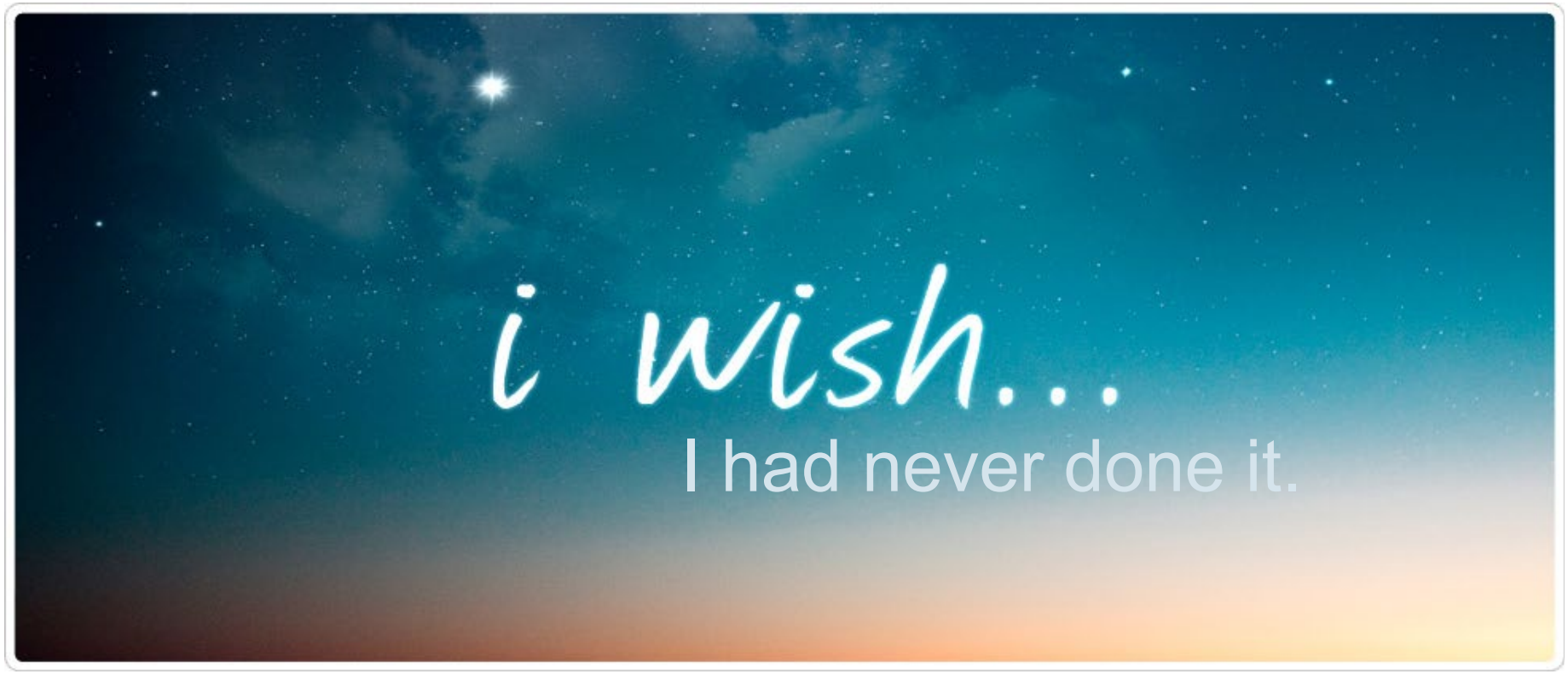
Time away from work

Need for assistive devices

Financial burden

- Complications
  - 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.

Elective Surgery – 2 Results



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Elective Surgery – 2 Results

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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 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.”
- Imponderables

Hip and Knee Complications

Table 1

Complications and Adverse Events Following Total Hip Arthroplasty as Developed by The Hip Society

Complication	Definition of Complication
Bleeding	Postoperative bleeding requiring surgical treatment
Wound complication	Failure of wound healing requiring reoperation or a change in THA protocol
Thromboembolic disease	Symptomatic thromboembolic event requiring more intensive, nonprophylactic anticoagulant or antithrombotic treatment during the first 3 months following index THA
Neural deficit	Postoperative neural deficit (sensory or motor) related to the index THA
Vascular injury	Intraoperative vascular injury requiring surgical repair, bypass grafting, or stenting (compartment syndrome or amputation should be reported)
Dislocation/instability	Dislocation of the femoral head out of the acetabulum or recurrent symptomatic subluxation of the hip joint (direction of instability and type of treatment should be recorded)
Periprosthetic fracture	Periprosthetic fracture of the proximal femur or the acetabulum (intraoperative fracture or postoperative fracture should be recorded, surgical or nonsurgical treatment should be recorded)
Abductor muscle disruption	Symptomatic abductor dysfunction that was not present before the surgery, associated with a positive Trendelenburg sign and use of an ambulatory assist (eg, cane, crutch, walker) for treatment of limp or weakness (nonsurgical management should be recorded)
Deep periprosthetic joint infection	A deep periprosthetic joint infection can be diagnosed when there is a sinus tract communicating with the prosthesis, or a pathogen is isolated by culture from at least two separate tissue or fluid samples obtained from the affected prosthetic joint, or four of the following six criteria exist: elevated ESR and serum CRP concentration; elevated synovial WBC count; elevated synovial PMN; presence of purulence in the affected joint; isolation of a microorganism in one culture of periprosthetic tissue or fluid; or >five neutrophils/high-power field in five high-power fields observed from histologic analysis of periprosthetic tissue at 400× magnification
Heterotopic ossification	Symptomatic heterotopic ossification at 1 year following surgery associated with stiffness, reduced range of motion, and radiographic grade of Brooker III or IV
Bearing surface wear	Wear of the bearing surface that is symptomatic or requires surgery
Osteolysis	Expansile lytic lesion adjacent to one of the implants that is ≥1 cm in any one dimension or increasing in size on serial radiographs/CT
Implant loosening	Implant loosening confirmed intraoperatively or identified radiographically as a change in implant position or a progressive radiolucent line at the bone-cement or bone-implant interface
Cup-liner dissociation	Dissociation of the cup liner from the acetabular cup
Implant fracture	Implant fracture (specific implant should be recorded)
Reoperation	Return to the operating room related to the index THA (reasons for reoperation should be recorded)
Revision	Revision of one or more of the THA implants (acetabular cup, acetabular liner, femoral head, femoral stem)
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)
Death	Death occurring for any reason during the first 90 days following THA (cause of death and relation to index THA should be recorded)

CRP = C-reactive protein, ESR = erythrocyte sedimentation rate, PMN = polymorphonuclear neutrophil, THA = total hip arthroplasty, WBC = white blood cell

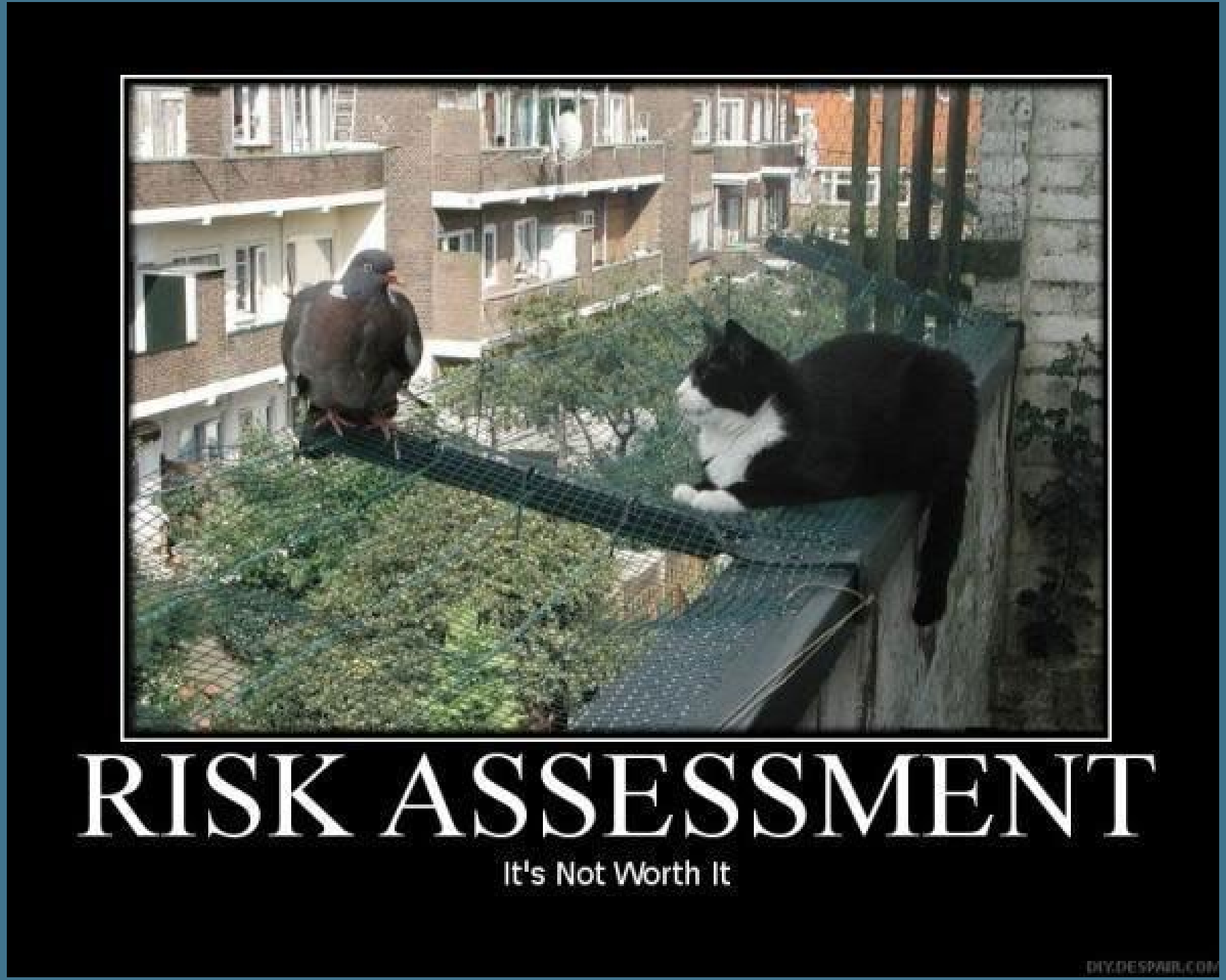
Table 2

Complications and Adverse Events Following Total Knee Arthroplasty as Developed by The Knee Society[5,6]

Complication	Definition of Complication
Bleeding	Postoperative bleeding requiring surgical treatment
Wound complication	Failure of wound healing requiring reoperation or a change in TKA protocol
Thromboembolic disease	Symptomatic thromboembolic event requiring more intensive, nonprophylactic anticoagulant or antithrombotic treatment during the first 3 months after index TKA
Neural deficit	Postoperative neural deficit (sensory or motor) related to the index TKA
Vascular injury	Intraoperative vascular injury requiring surgical repair, bypass grafting, or stenting (compartment syndrome or amputation should be reported)
Medial collateral ligament injury	Intraoperative or early postoperative medial collateral ligament injury requiring repair, reconstruction, a change in prosthetic constraint, revision surgery, or TKA protocol
Instability	Symptomatic instability reported by the patient and confirmed by laxity on physical examination as defined by The Knee Society Knee Score
Malalignment	Symptomatic malalignment reported by the patient and confirmed radiographically with angular deformity in the coronal plane >10° from the mechanical axis
Stiffness	Limited ROM as reported by the patient and demonstrated in a physical examination with extension limited to 15° short of full extension or flexion <90° (not applicable if preoperative arc of motion <75°)
Deep periprosthetic joint infection	A deep periprosthetic joint infection can be diagnosed when there is a sinus tract communicating with the prosthesis, or a pathogen is isolated by culture from at least two separate tissue or fluid samples obtained from the affected prosthetic joint, or four of the following six criteria exist: elevated ESR and serum CRP concentration; elevated synovial WBC count; elevated synovial PMN; presence of purulence in the affected joint; isolation of a microorganism in one culture of periprosthetic tissue or fluid; or >five neutrophils/high-power field in five high-power fields observed from histologic analysis of periprosthetic tissue at 400× magnification
Periprosthetic fracture	Periprosthetic fracture of the distal femur, proximal tibia, or patella (surgical or nonsurgical treatment should be recorded)
Extensor mechanism disruption	Disruption of the extensor mechanism (surgical repair and/or extensor lag should be recorded)
Patellofemoral dislocation	Dislocation of the patella from the femoral trochlea (direction of instability should be recorded)
Tibiofemoral dislocation	Dislocation of the tibiofemoral joint (direction of instability should be recorded)
Bearing surface wear	Wear of the bearing surface symptomatic or requiring reoperation
Osteolysis	Expansile lytic lesion adjacent to one of the implants >1 cm in any one dimension or increasing in size on serial radiographs/CT
Implant loosening	Implant loosening confirmed intraoperatively or identified radiographically as a change in implant position or a progressive, radiolucent line at the bone-cement or bone-implant interface
Implant fracture or tibial insert dissociation	Implant fracture or dissociation of the tibial insert from the tibial implant
Reoperation	Return to the operating room related to the index TKA (reasons for reoperation should be recorded)
Revision	Revision of one or more of the TKA implants (femur, tibia, tibial insert, patella)
Readmission	Admission to the hospital for any reason during the first 90 days after TKA (reasons for admission and relation to index TKA should be recorded)
Death	Death occurring for any reason during the first 90 days after TKA (cause of death and relation to index TKA should be recorded)

CRP = C-reactive protein, ESR = erythrocyte sedimentation rate, PMN = polymorphonuclear neutrophil, ROM = range of motion, TKA = total knee arthroplasty, WBC = white blood cell

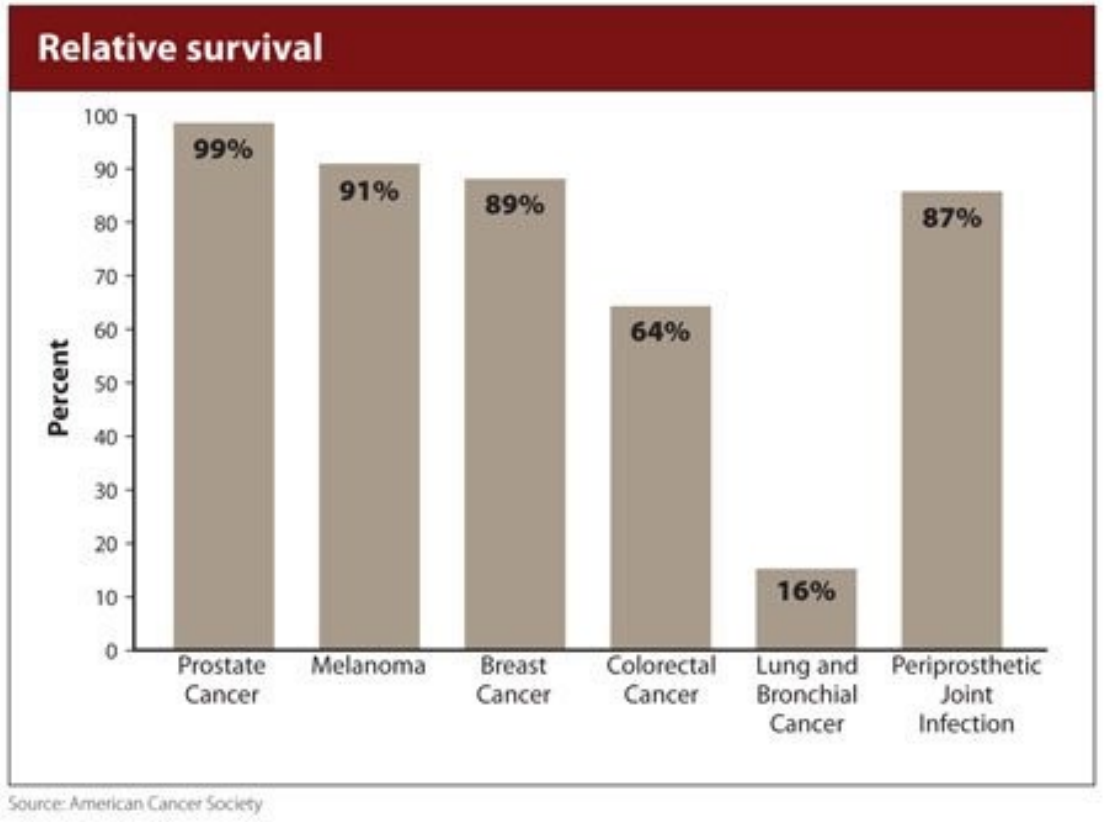
JAAOS 23:11, 2015


RISK ASSESSMENT
It's Not Worth It
DIY.DESPAIR.COM

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
  - 1M TJA * 1% * $60K = $600M
- $1.62 Billion is current cost estimate



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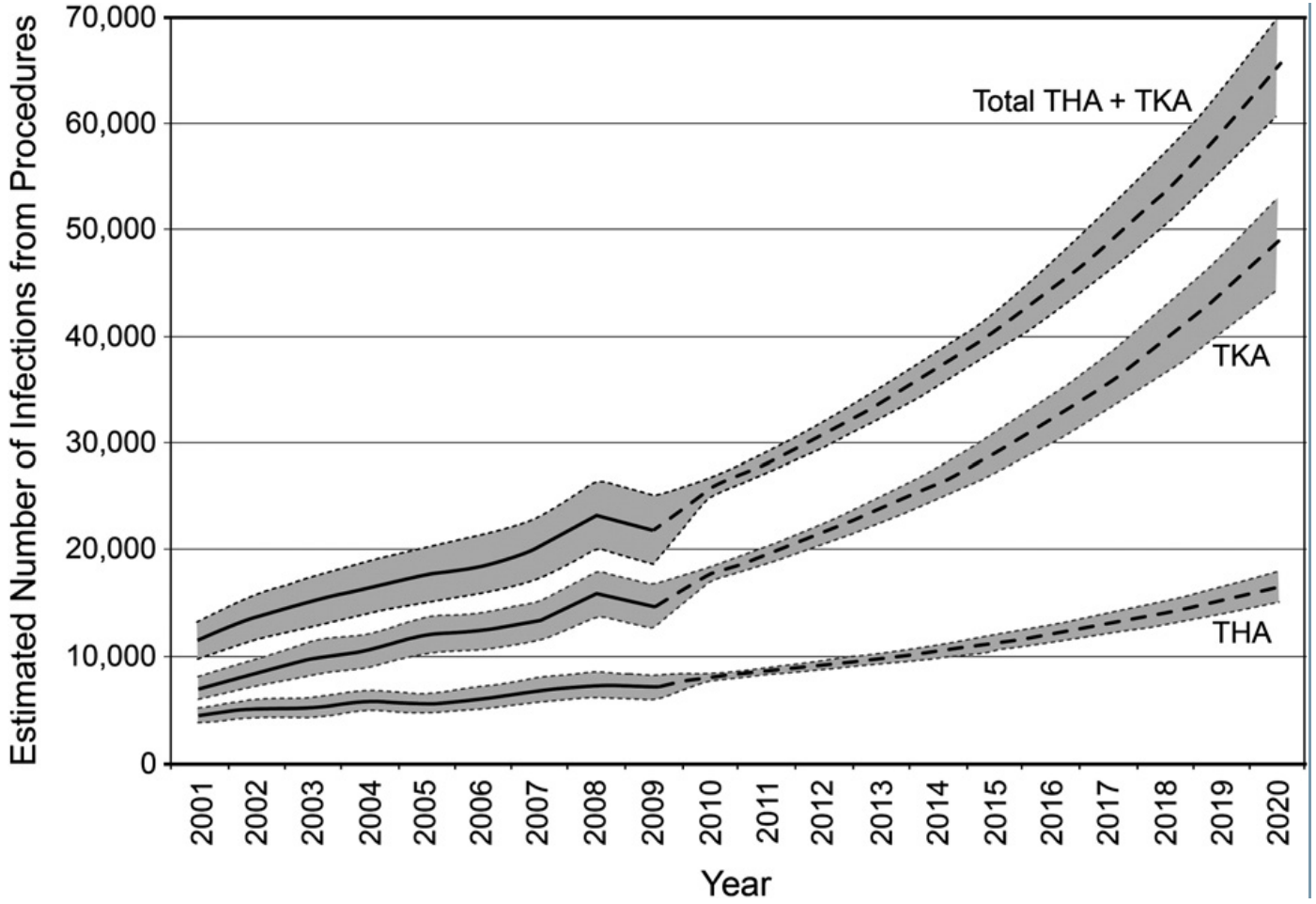
Economic Burden of Periprosthetic Joint Infection in the United States

Steven M. Kurtz, PhD, Edmund Lau, MS, Heather Watson, PhD, Jordana K. Schmier, MA, Javad Parvizi, MD

The Journal of Arthroplasty Vol. 27 No. 8 Suppl. 1 September 2012



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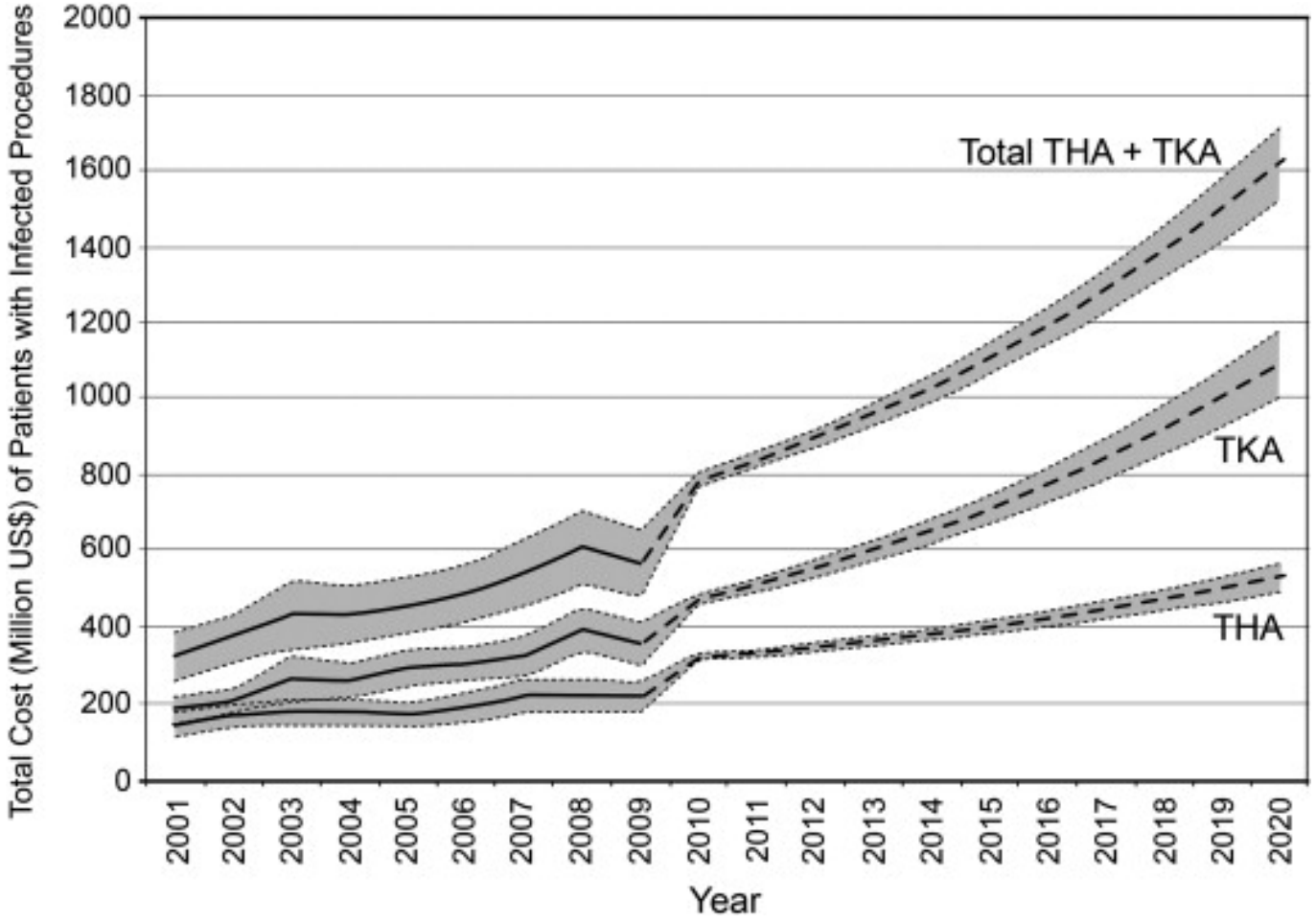

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Risk Factors

- Inflammatory Arthritis (2-8%)
- Diabetes (3.1-13.5%)
- Immunosuppressed
  - HIV
  - 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
- Vascular disease
  - Arterial
  - Cardiac
  - Venous 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)

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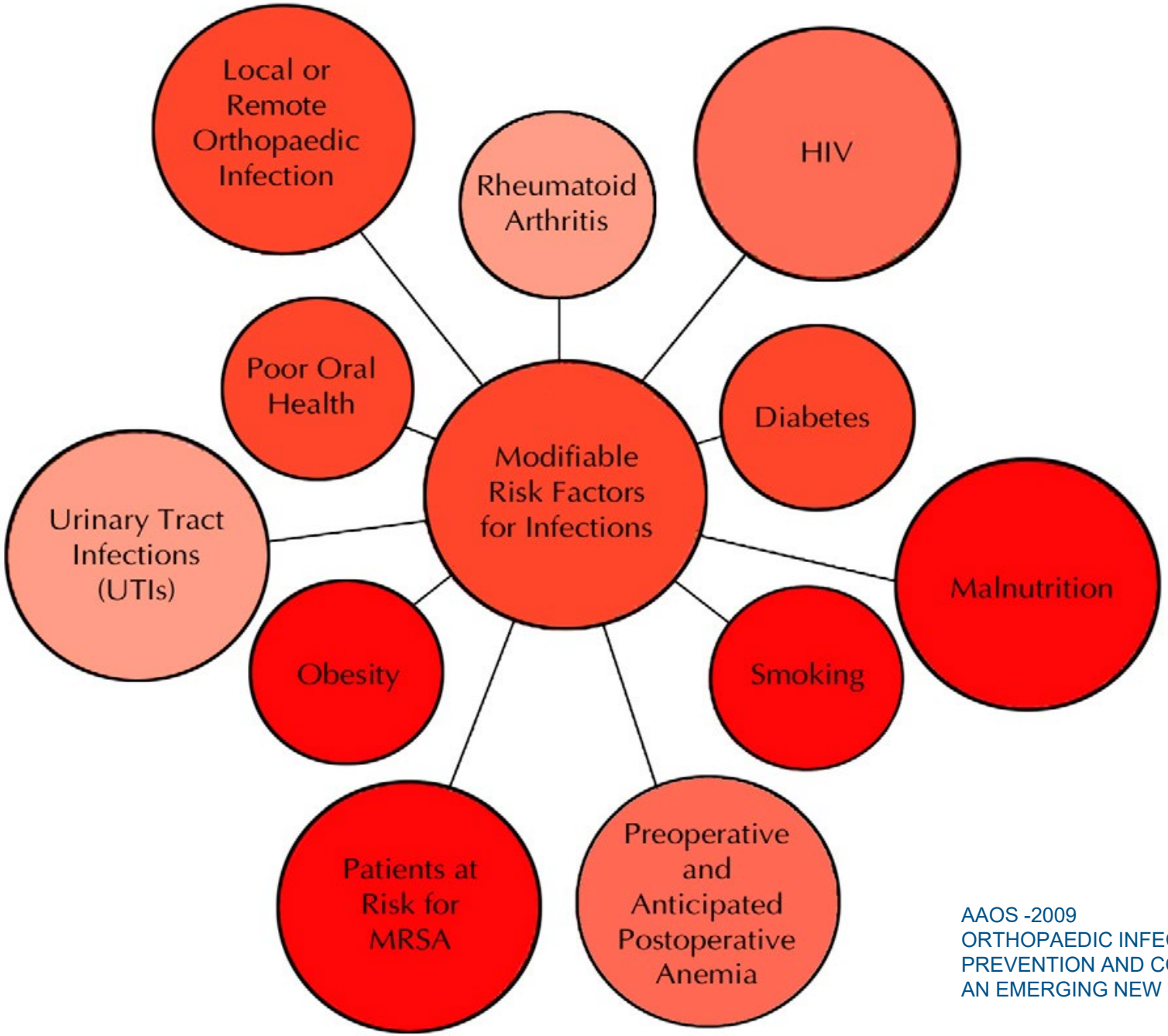

AAOS -2009
ORTHOPAEDIC INFECTION PREVENTION AND CONTROL:
AN EMERGING NEW PARADIGM

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

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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

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

AAOS CPG Hip OA 2023

DIABETES: ADVERSE EVENTS

Limited evidence suggests that patients with symptomatic osteoarthritis of the hip and poorly controlled diabetes may be at a higher risk for adverse events after total hip arthroplasty.

Quality of Evidence: Low

Strength of Option: Limited ★★☆☆

Evidence from two or more "Low" quality studies with consistent findings or evidence from a single "Moderate" quality study recommending for or against the intervention. Also, higher strength evidence can be downgraded to limited due to major concerns addressed in the EtD Framework.

- Few articles in literature comparing diabetic and non-diabetic patients and their outcomes after total hip arthroplasty
- Patients without diabetes or with controlled diabetes without complications had more favorable outcomes than patients with uncontrolled diabetes or controlled diabetes with complications.
- Complications include overall complications, acute myocardial infarction, pulmonary embolism, pneumonia, sepsis/septicemia/shock, surgical site bleeding, and joint/wound infection

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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/mm^3

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

Fewer Complications Following Revision Hip and Knee Arthroplasty with Normal Vitamin D

Sophia Traven MD, Alexander Chiaramonti MD, William Barfield PhD, Patricia Kirkland BS, Harry Demos MD, H Del Schutte MD, Jacob Drew MD
Medical University of South Carolina

Abstract

We hypothesized low vitamin D to be a surrogate for nutritional status and that, when controlling for nutrition, it would not be predictive of increased rate of complications and readmissions following revision TJA. A retrospective review of 126 revision TJA patients between 2010-2014 was performed. Low vitamin D was not associated with nutritional markers nor risk of 30-day readmission, but was associated with increased risk of 90-day complications and PJI as the reason for revision surgery. Vitamin D level may be considered a modifiable risk factor for revision TJA.

Background

Vitamin D deficiency affects 32% of the general population and 39% of orthopaedic patients.

In the primary TJA, low vitamin D levels have been correlated with worse outcomes including higher complication rates, higher postoperative infection rates, and higher pain scores.

However, there remains no consensus on vitamin D in the orthopaedic literature nor its relationship to nutritional status.

METHODS

An IRB-approved retrospective review on all revision TKA and THA between 2010-2014 was performed.

Data collected included:
- Demographics
- Nutrition (prealbumin, transferrin, and total lymphocyte count)
- Vitamin D level 3 months prior to the date of surgery

The primary outcomes were:
- 30-day readmission rate
- 90-day complication rate

	Low Vit D	Normal Vit D
Gender	28M, 41F	28M, 29F
Age	63.5 yrs	67.7 yrs
BMI	31.1	30.4
Tobacco Use	6	5
CCI	1.1	0.9
THA vs TKA	35K, 34H	29K, 28H
PJI	34.8%	15.8%

Fig 1. Patient demographics

Results

Neither nutritional markers nor 30-day readmission were correlated with vitamin D levels ($p>0.11$ and $p=0.58$, respectively).

However, **90-day complication rate was significantly higher among patients with low vitamin D** despite controlling for nutrition and preoperative PJI ($p=0.034$).

Additionally, patients undergoing revision surgery for PJI were more likely to have low vitamin D than those undergoing revision surgery for aseptic indications ($p=0.016$).

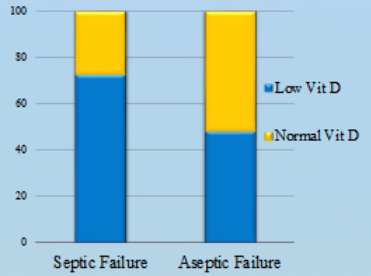
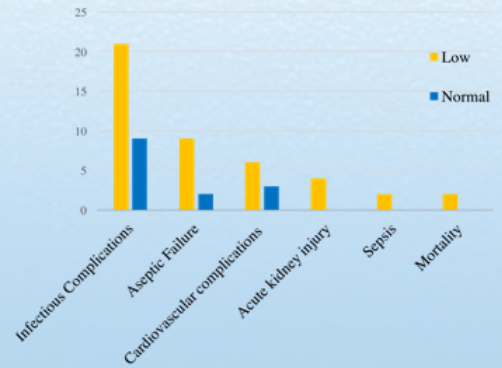


Fig 2. Reason for revision surgery

Additionally, patients with low vitamin D were more likely to:

1) Experience postoperative wound infection, delayed wound healing, sepsis, and mortality ($p<0.001$),
2) Have multiple complications ($p<0.001$),
3) And require unplanned reoperation within 90 days ($p<0.001$)

Fig 3. Postoperative complications by vitamin D levels



Conclusion

The prevalence of low vitamin D among the revision total joint population is much higher than the general population (55% vs 32%).

Patients undergoing revision TJA as a consequence of PJI were more likely to have low vitamin D.

Vitamin D may be an independent predictor of:
1) 90-day complications,
2) Postoperative infections, and
3) Unplanned reoperation

Consideration should be given to measuring and correcting vitamin D level prior to surgery as a potentially modifiable risk factor.

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Revision Arthroplasty

Fewer Complications Following Revision Hip and Knee Arthroplasty in Patients With Normal Vitamin D Levels

Sophia A. Traven, MD [a,*], Alexander M. Chiaramonti, MD [a], William R. Barfield, PhD [a], Patricia A. Kirkland, BS [a], Harry A. Demos, MD [a], Harold D. Schutte, MD [b], Jacob M. Drew, MD [a]

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ABSTRACT

Background: Surgeons and hospitals increasingly face penalty for complications and readmission following total joint arthroplasty; therefore, optimization of modifiable risk factors is paramount. Literature associates low vitamin D with risk of periprosthetic joint infection, and we hypothesized low vitamin D to be predictive of increased rate of complications and readmissions.
Methods: A retrospective review of 126 revision total joint arthroplasty patients between 2010 and 2014 was performed.
Results: Low vitamin D was not associated with risk of 30-day readmission but was found to be associated with an increased risk of 90-day complications as well as periprosthetic joint infection as the reason for revision surgery.
Conclusion: Preoperative vitamin D level should be considered a modifiable risk factor for complications following revision arthroplasty.

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"I AM TOO HEAVY FOR A JOINT REPLACEMENT"

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
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

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 »

London Health Sciences Centre

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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

AAHKS American Association of Hip and Knee Surgeons

MUSC Medical University of South Carolina

Contents lists available at ScienceDirect

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journal homepage: www.arthroplastyjournal.org

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

Russell A. Reeves, MD, MS [a], Glenn D. Hefter, MS [b], Vincent D. Pellegrini Jr., MD [c], Jacob M. Drew, MD [d], William R. Barfield, PhD [e, *], Harry A. Demos, MD [e]

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[b] Department of Bioengineering, Clemson-Medical University of South Carolina, Charleston, SC
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total knee arthroplasty
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^2) and super obese (BMI $\geq$50 kg/m^2) patients with hip or knee osteoarthritis. Patients with less than 3-month 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 morbid and 50 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 (20.0% vs 41.7%, $P = .004$). Each 1 kg/m^2 increase in BMI decreased the odds of TJA by 10.9% (odds ratio = 0.891, 95% confidence interval: 0.833-0.953, $P = .001$). Forty (23.0%) of the nonoperatively treated patients achieved clinically meaningful weight loss, and 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%).
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 inconsistently 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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AAOS CPG Hip OA 2023

BMI: ADVERSE EVENTS

Limited evidence suggests that elevated BMI may increase the risk of adverse events in patients undergoing total hip arthroplasty for symptomatic hip osteoarthritis.

Quality of Evidence: Low

Strength of Option: Limited ★★☆☆

Evidence from two or more "Low" quality studies with consistent findings or evidence from a single "Moderate" quality study recommending for or against the intervention. Also, higher strength evidence can be downgraded to limited due to major concerns addressed in the EtD Framework.

BMI: CLINICAL OUTCOMES

Limited evidence supports that patients with elevated BMI and symptomatic osteoarthritis of the hip may achieve lower absolute patient reported outcome scores but a similar degree of improvement in patient satisfaction, pain, function, and quality of life after total hip arthroplasty.

Quality of Evidence: Low

Strength of Option: Limited ★★☆☆

Evidence from two or more "Low" quality studies with consistent findings or evidence from a single "Moderate" quality study recommending for or against the intervention. Also, higher strength evidence can be downgraded to limited due to major concerns addressed in the EtD Framework.

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Glucagon-like Peptide-1 Agonists: What the Orthopaedic Surgeon Needs to Know

JBJS REVIEWS 2024;12(1):e23.00167 · http://dx.doi.org/10.2106/JBJS.RVW.23.00167

- Orthopaedic surgeons are increasingly likely to encounter patients with obesity and/or type 2 diabetes taking glucagon-like peptide-1 (GLP-1) agonists for weight loss.
- GLP-1 agonists are an effective treatment for weight loss with semaglutide and tirzepatide being the most effective agents. Randomized controlled trials using these agents have reported weight loss up to 21 kg (46 lb).
- The use of GLP-1 agonists preoperatively can improve glycemic control, which can potentially reduce the risk of postoperative complications. However, multiple cases of intraoperative aspiration/regurgitation have been reported, potentially related to the effect of GLP-1 agonists on
- gastric emptying.
- While efficacious, GLP-1 agonists may not produce sufficient weight loss to achieve body mass index cutoffs for total joint arthroplasty depending on individual patient factors, including starting bodyweight. Multifactorial approaches to weight loss with focus on lifestyle modification in addition
- to GLP-1 agonists should be considered in such patients.
- Although GLP-1 agonists are efficacious agents for weight loss, they may not be accessible or affordable for all patients. Each patient's unique circumstances should be considered when creating an ideal weight loss plan during optimization efforts

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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

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

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

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):103–105, 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

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AAOS CPG Hip OA 2023

TOBACCO

Limited evidence suggests that patients with symptomatic osteoarthritis of the hip who use tobacco products may be at an increased risk for adverse events after total hip arthroplasty.

Quality of Evidence: Low

Strength of Option: Limited ★★☆☆

Evidence from two or more "Low" quality studies with consistent findings or evidence from a single "Moderate" quality study recommending for or against the intervention. Also, higher strength evidence can be downgraded to limited due to major concerns addressed in the EtD Framework.

- There is a lack of clarity in the literature regarding different forms of tobacco use.
- Smoking is widely considered to be more significant than other forms of tobacco use.
- Most of the studies have investigated the effect of smoking on surgical outcome.
- One low quality study (Sadr Azodi 2006) showed increased systemic complications in both current and former smokers, while another prospective study (Gonzalez 2018) showed increased PJI in current and former smokers.
- Lung (2023) reported that smoking is an independent risk factor for sustaining periprosthetic fracture.

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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)

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

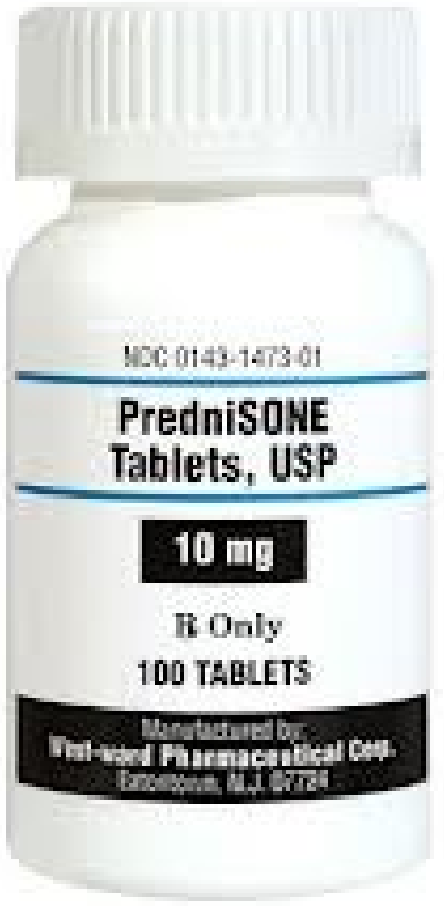
Increased risk of infection in TKA

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)



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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

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

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

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 (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

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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

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 a 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

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%
- 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 / µL 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”

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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

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 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

AAOS CPG Hip OA 2023

PRESCRIPTION OPIOID AS CONSERVATIVE TREATMENT

In the absence of sufficient evidence, it is the opinion of the workgroup that oral opioids not be utilized for nonoperative treatment of symptomatic osteoarthritis of the hip.

Quality of Evidence: Consensus
Strength of Option: Consensus ★☆☆☆
There is no supporting evidence, or limited level evidence was downgraded due to major concerns addressed in the EtD framework. In the absence of reliable evidence, the guideline work group is making a recommendation based on their clinical opinion.

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AAOS American Academy of Orthopaedic Surgeons
American Association 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.

AAHKS
AMERICAN ASSOCIATION OF HIP AND KNEE SURGEONS

Your Complete Guide to Joint Replacement

Trustworthy information from AAHKS surgeon members

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)

Patient Reported Outcome Measures

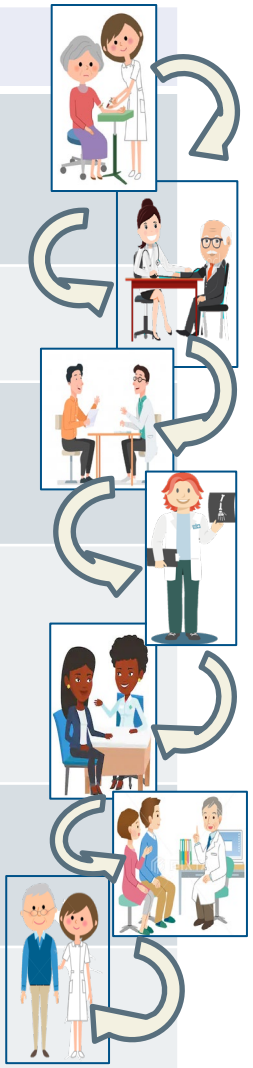
Consent, H&P, Hospitalist consult, all labs completed

Cardiology, transplant, pulmonary, hematology, dental, allergy, and other consults reviewed or initiated

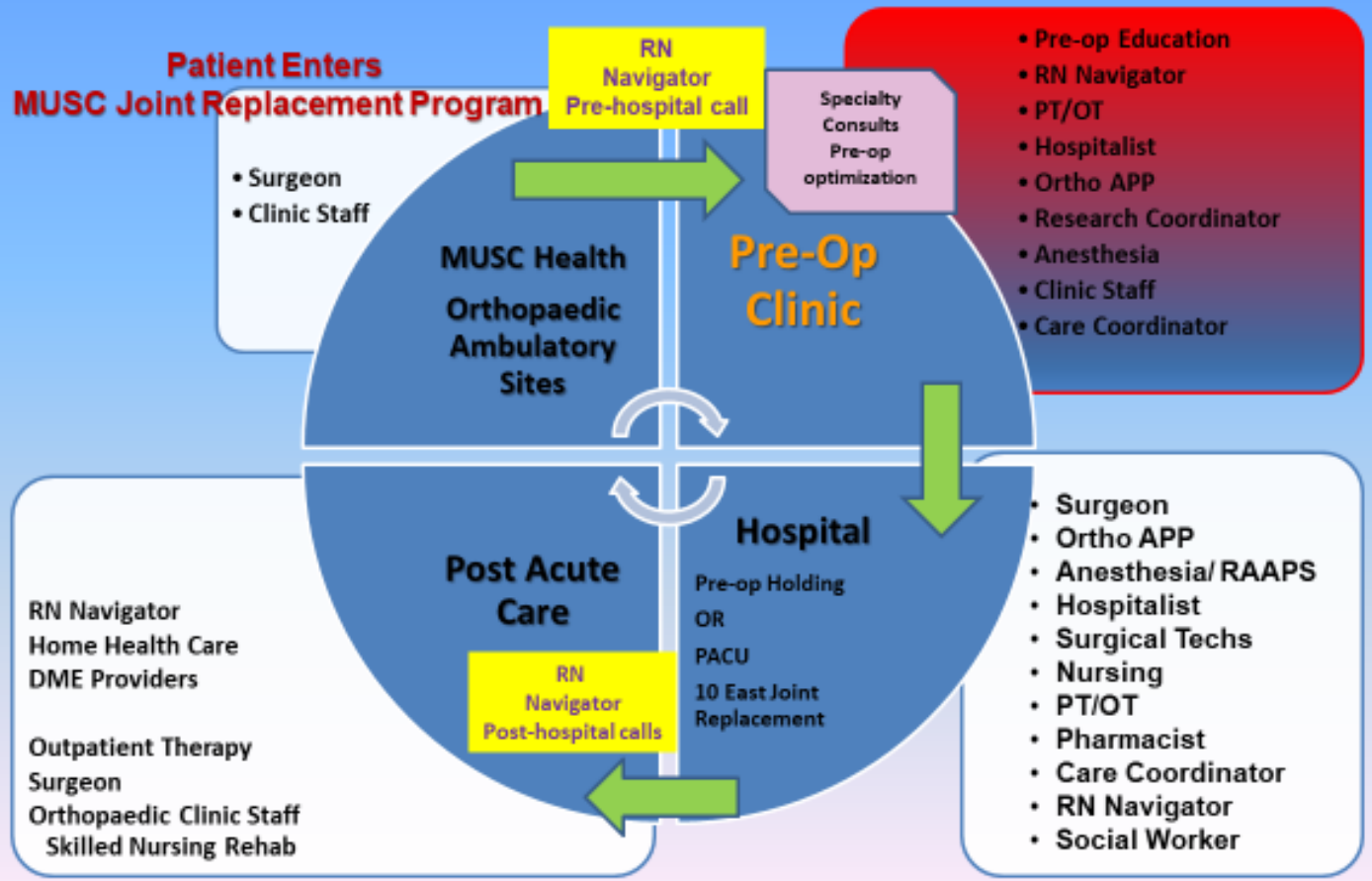
Surgery rescheduled as needed

Pre-op Workup Clinic

LAB:	The first appointment is in the Pre-Op Clinic Lab. Two phlebotomists work simultaneously to collect blood, urine , and nasal swab. This takes approximately 15 minutes per patient.
NURSE:	Next, a Pre-Op Clinic Nurse brings the patient into an exam room and collects the following: - Vital signs - Weight - Review of the past medical-history - Update medication list - Performs an EKG - Mini-Cog - HOOS/KOOS Jr
RESEARCH:	The Research Coordinator then meets with the patient to discuss current research projects led by our joint replacement surgeons. All necessary information and consents are gathered for the study at this time.
ORTHO:	Each patient is seen by an Orthopaedic PA or NP, who reviews the orthopedic history. Their note then serves as the H&P on the day of surgery. The provider also reviews the surgery consent form and has the patient sign it. The consent is then scanned into the patient's chart so it is available on the day of surgery. The surgeons are not present for these appointments.
HOSPITALIST:	Every patient is also evaluated by one of our Internal Medicine physicians or NP. The patient's entire medical history is reviewed by this provider with special attention to peri-operative management of chronic conditions and medications. The patient is either considered "cleared" for surgery, or must complete additional testing/appointments. If this can be completed prior to surgery (as coordinated by the Nurse Navigator), then a member of the Hospitalist team reviews the new information, addends the note, and the patient may proceed with surgery. In some cases, surgery must be postponed.
ANESTHESIA:	Some patients also see a provider from our anesthesiology team. Not every patient will be asked to do this, but those with a history of pulm HTN, malignant hyperthermia, difficult intubation, or other complications will be assessed. All patients, even those who didn't see the anesthesiologist as a part of the Pre-Op visit, will meet with them on the day of surgery.
	At the end of the Pre-Op visit, patients must attend one of our joint education classes led by the Nurse Navigator. The class lasts approximately 20 minutes and may be held multiple times during the Pre-Op Clinic day. Patients who have had a joint replacement at our hospital within the last year are excused from the class, but must still meet with the Nurse Navigator.



Phases & Transitions of Care



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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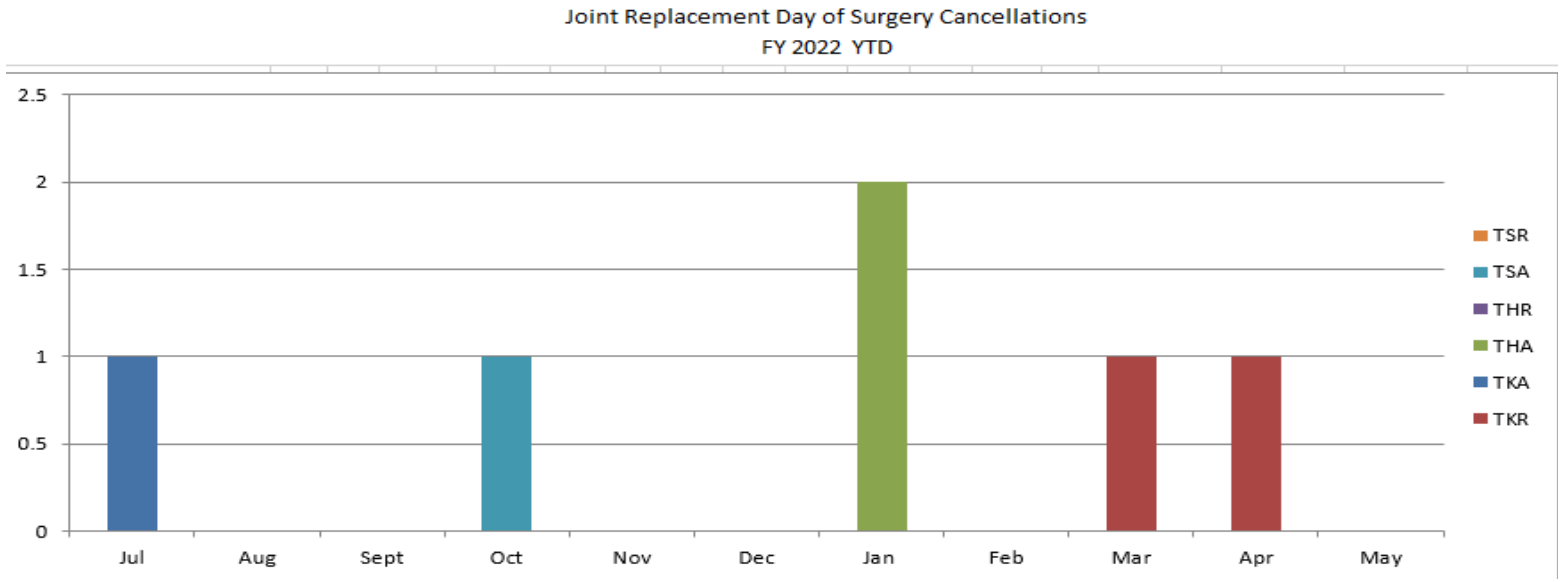

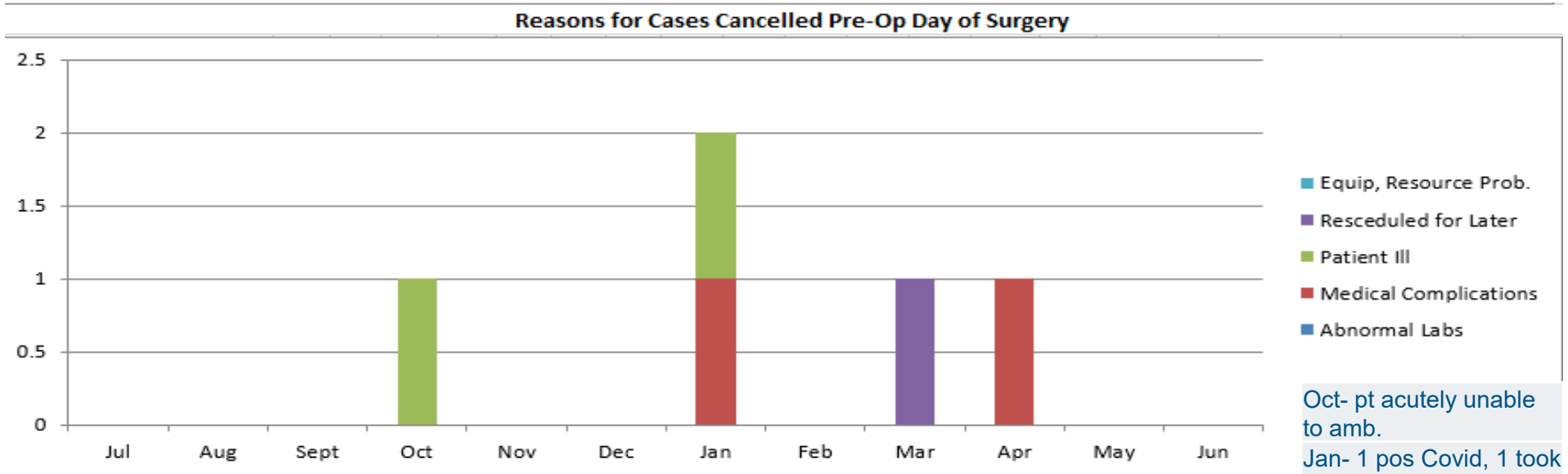

Oct- pt acutely unable to amb.
Jan- 1 pos Covid, 1 took Eliquis
Mar- cx by surgeon , resched
Apr- on Prednisone

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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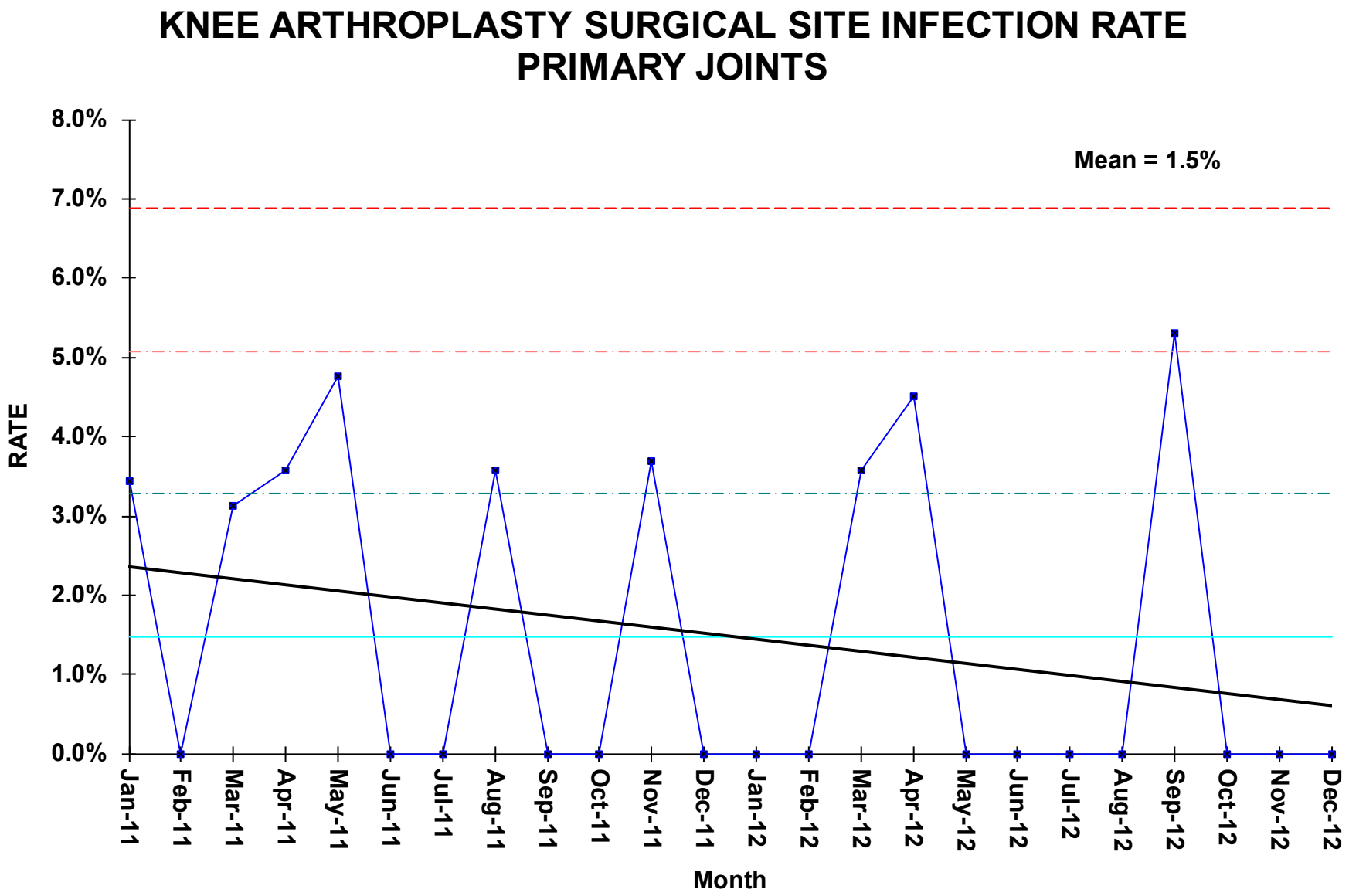
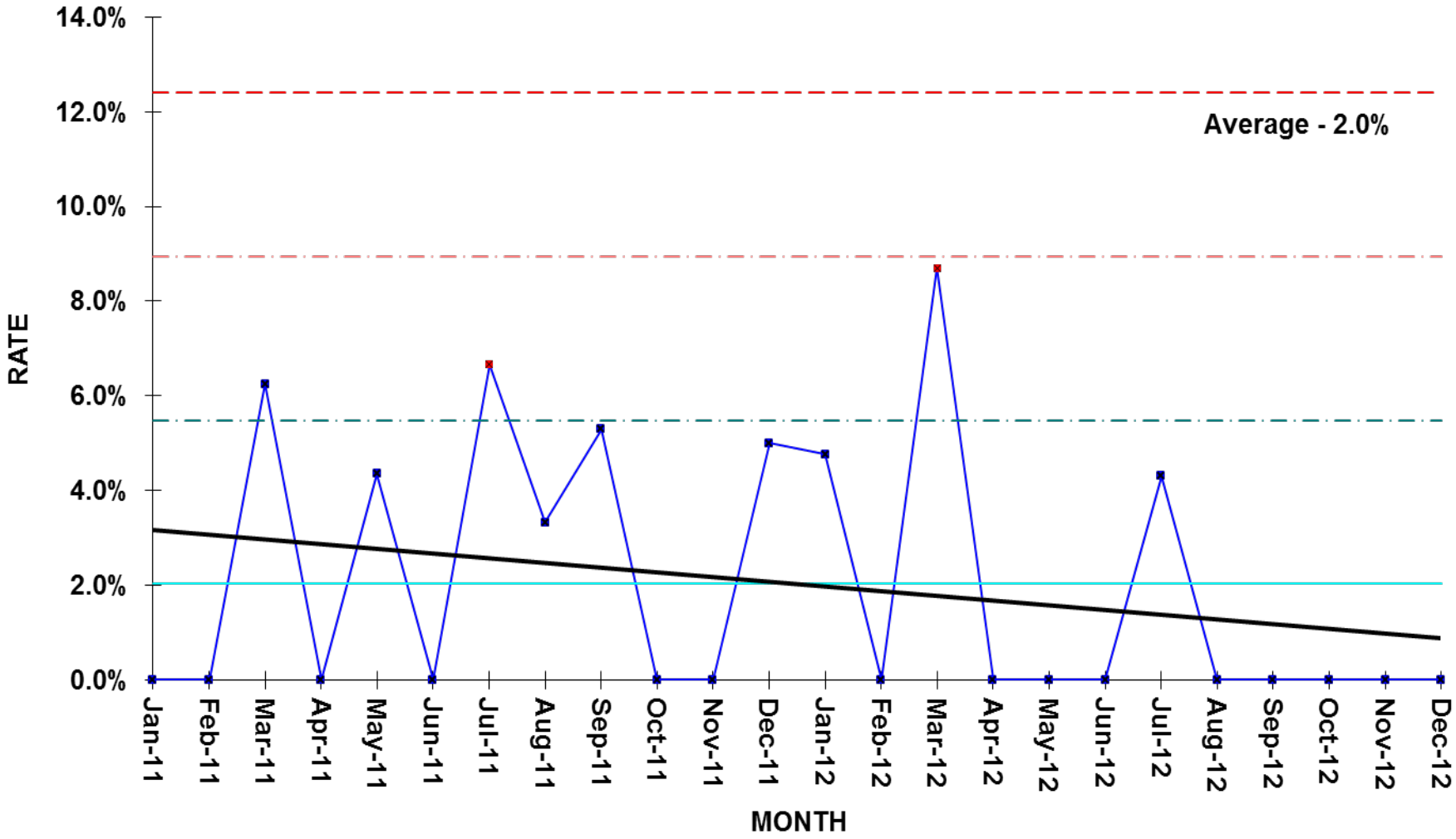
** FOR JOINT COMMISSION SPECIALTY CERTIFICATION – EXCLUDES TRAUMA AND ONCOLOGY PROCEDURES



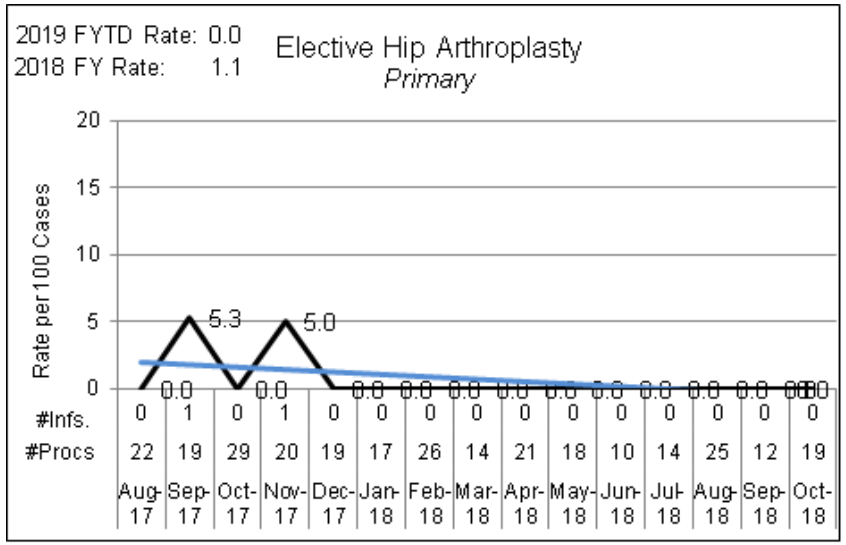
** FOR JOINT COMMISSION SPECIALTY CERTIFICATION – EXCLUDES TRAUMA AND ONCOLOGY PROCEDURES

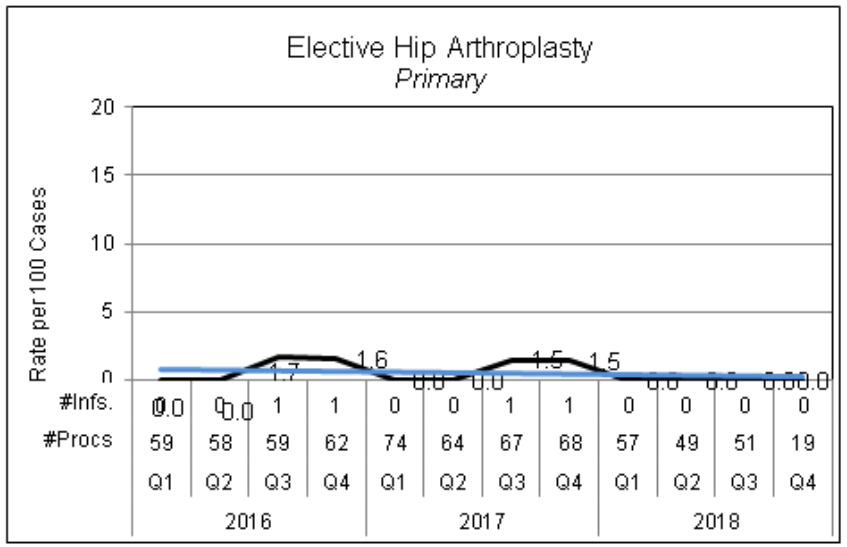
HIP ARTHROPLASTY SURGICAL SITE INFECTION RATE PRIMARY and REVISION PROCEDURES

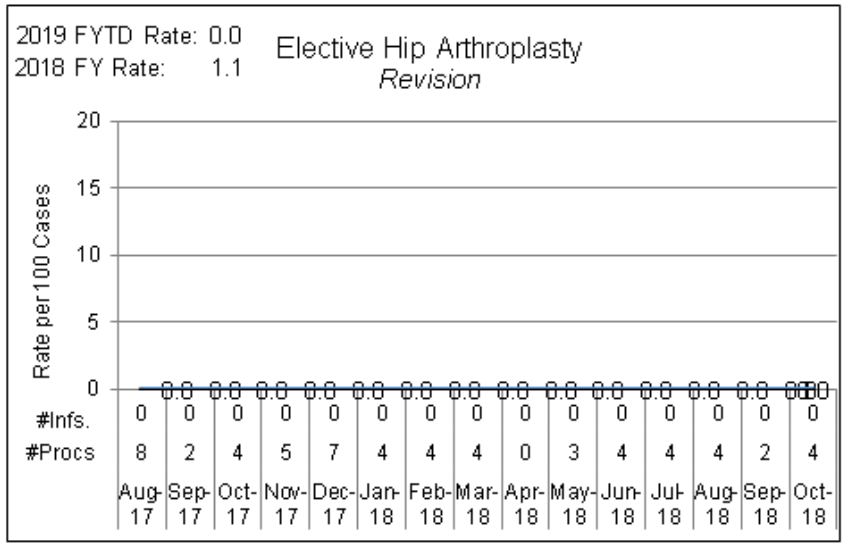


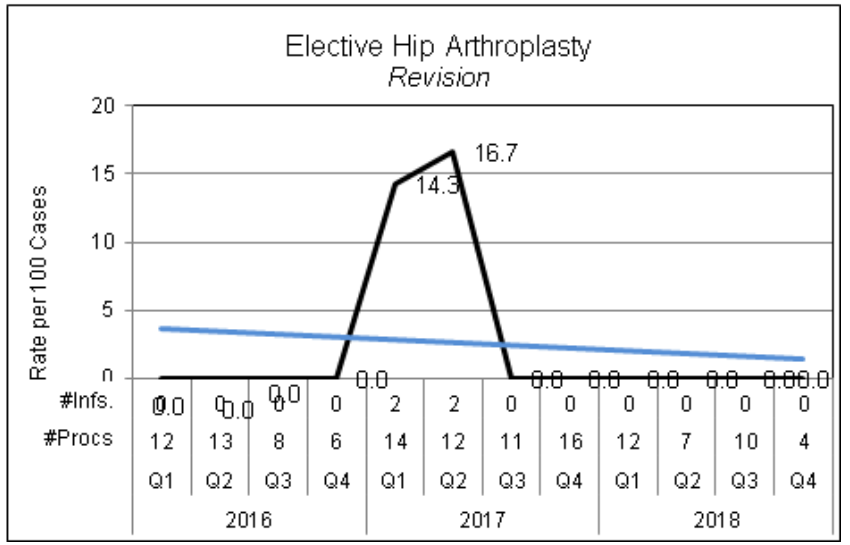
Disease Specific Rates

Hips









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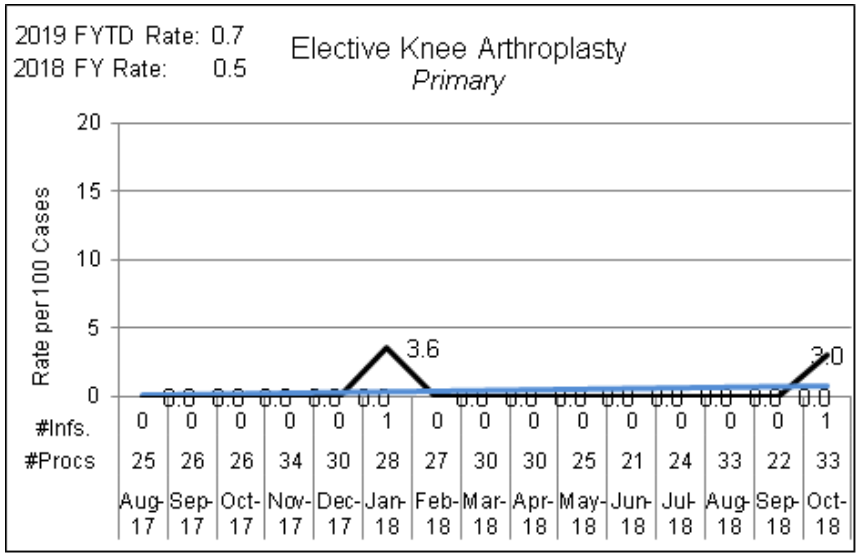
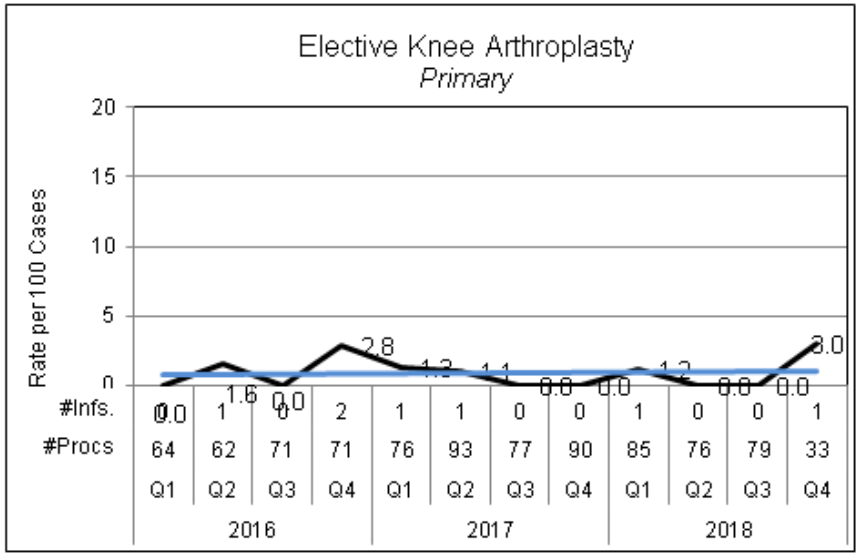
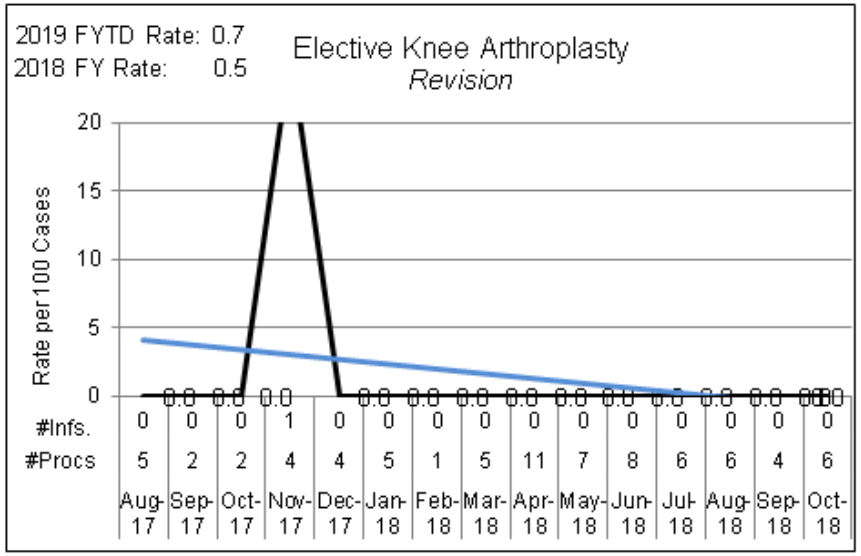
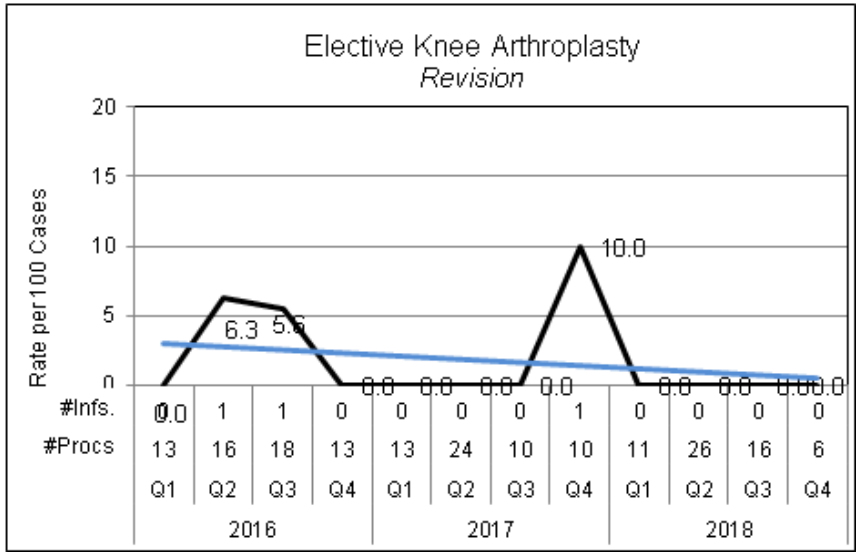
Disease Specific Rates (cont'd)

Knees









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