



2021 Napa Primary Care Conference

Osteoarthritis in the Active Adult: A Primary Care Sports Medicine Approach



Francis G. O'Connor, MD, MPH, FACSM
Medical Director, Consortium for Health and Military Performance
Professor, Military and Emergency Medicine
Uniformed Services University of the Health Sciences, Bethesda, MD

Disclosure Information

The information presented in this activity represents the opinions of the author and not those of the Department of Defense or the Uniformed Services University

Francis G. O'Connor, MD, MPH, has no financial interests or relationships to disclose.



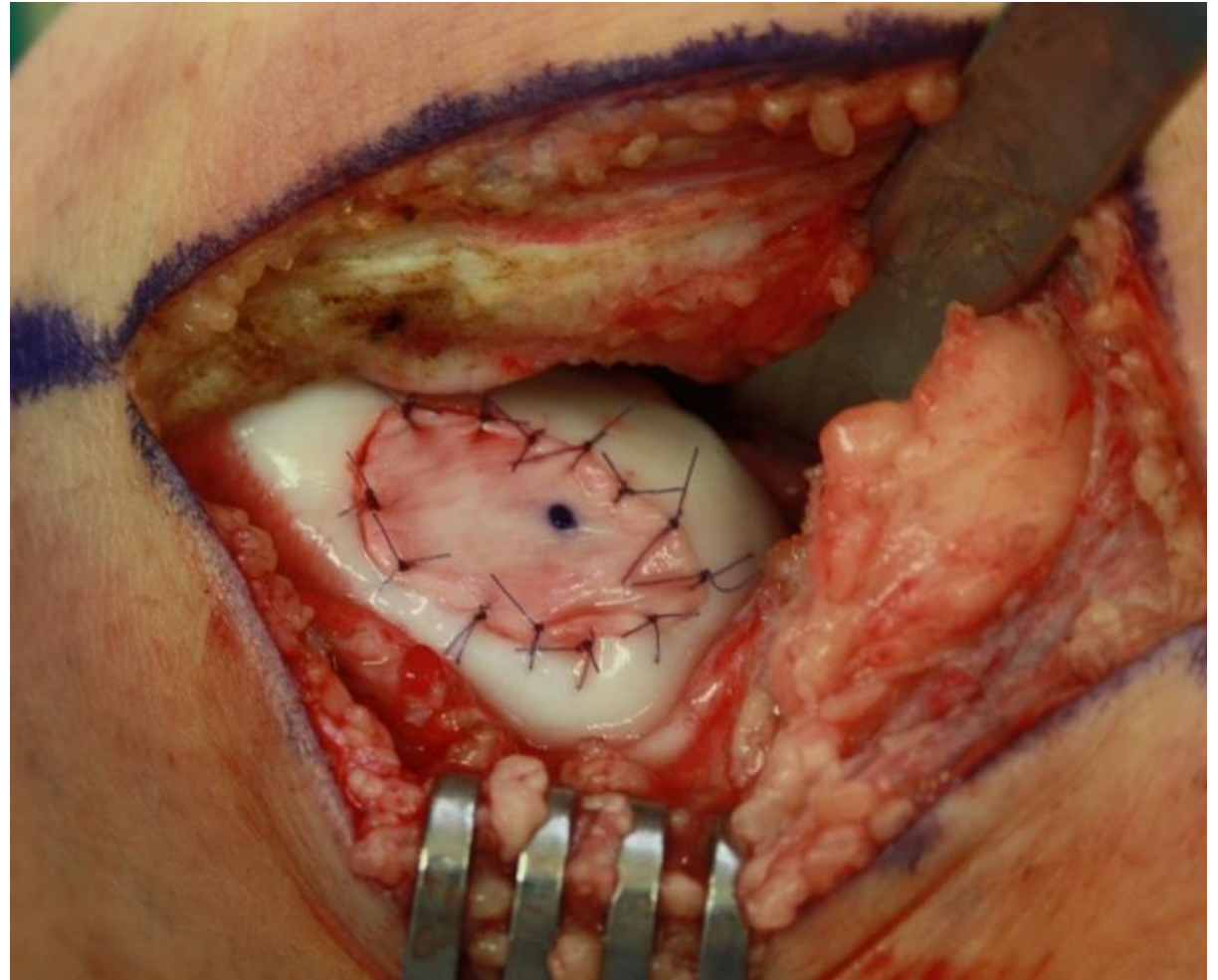
Case Presentation

- Tom is a 51 y/o male, retired Army Colonel, with a diagnosis of right knee osteoarthritis.
- History of being a collegiate wrestler, as well as a recreational runner with completion of seven marathons.
- History of right knee trauma 30 yrs ago.
- Currently with difficulty walking 18 holes of golf.
 - Imaging with mild joint line narrowing and subchondral sclerosis
 - No meniscal tear by MRI
 - Mild to moderate tibia varum



Case Presentation

- An orthopedic surgeon is recommending a high tibial osteotomy and autologous cartilage transplant implantation.
- He wants your advice on what might be effective non-operatively prior to considering a surgical intervention.



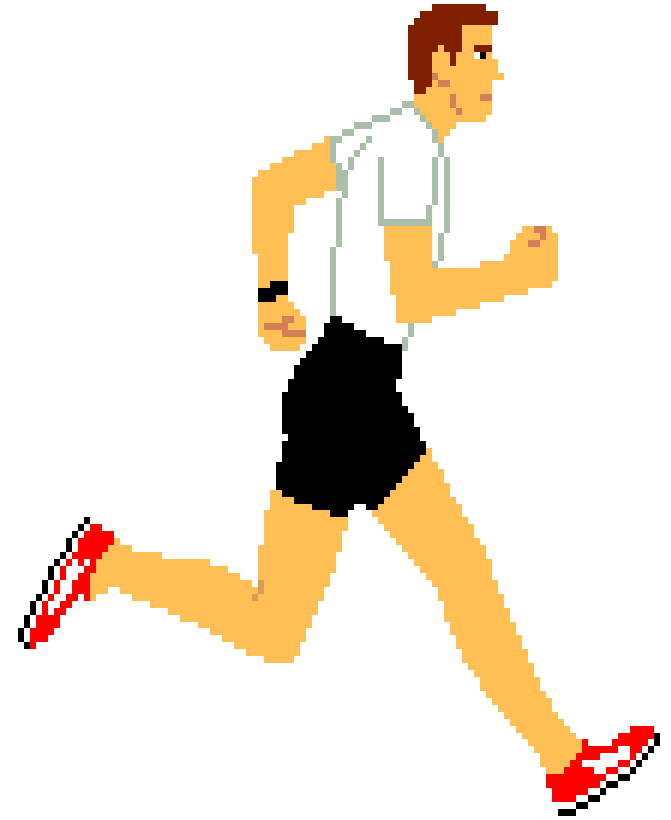
Most importantly...he's your golf partner!

Learning Objectives

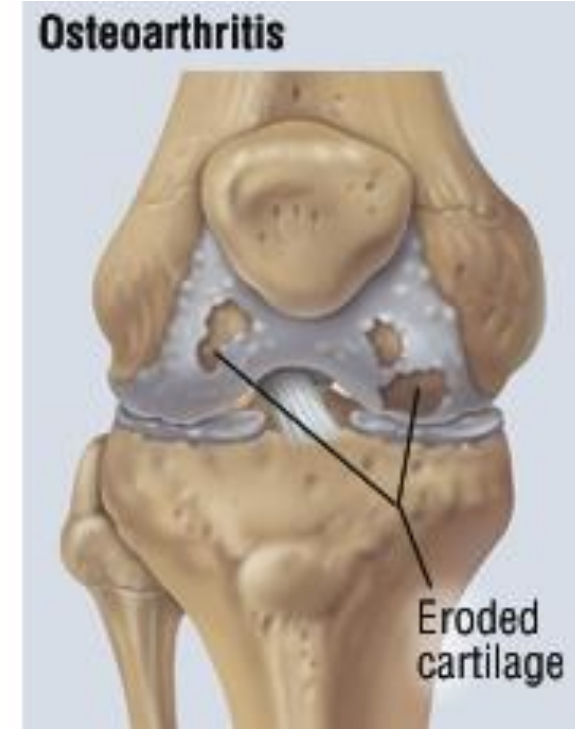
- **Define and Review** the Epidemiology of Osteoarthritis
- **Identify** Risk Factors for Osteoarthritis
- **Apply** Evidence-Based Treatments for Patients with Osteoarthritis
- **Educate** Patients on the Timing of Surgical Intervention



Definition and Epidemiology of Osteoarthritis

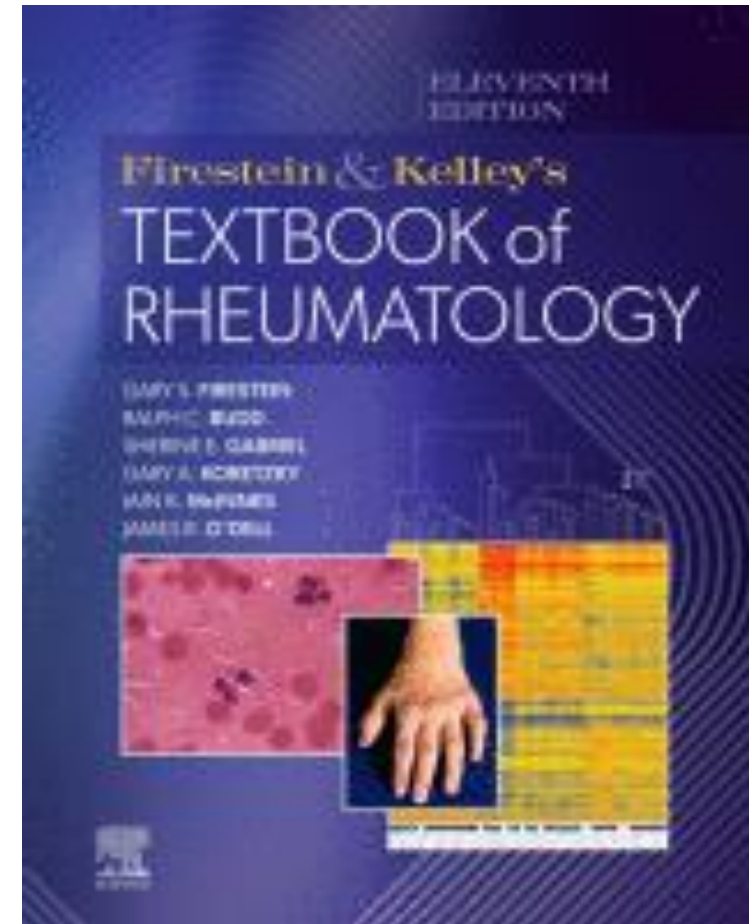


What is Osteoarthritis?



What is Osteoarthritis?

- Osteoarthritis (OA) is a joint disease that occurs primarily in older people and is characterized by **degradation of the articular cartilage**, hypertrophy of bone at the margins (i.e., osteophytes), subchondral sclerosis, and a range of biochemical and morphologic alterations of the **synovial membrane and joint capsule**.
- Pathologic changes in the late stages of OA include **softening, ulceration, and focal disintegration of the articular cartilage**; **synovial inflammation may also occur**.
- Typical clinical symptoms are **pain and stiffness, particularly after prolonged activity**.



“Despite its prevalence, the precise etiology, pathogenesis, and progression of OA remain beyond our understanding...”

Kelley and Firestein's Textbook of Rheumatology 2021

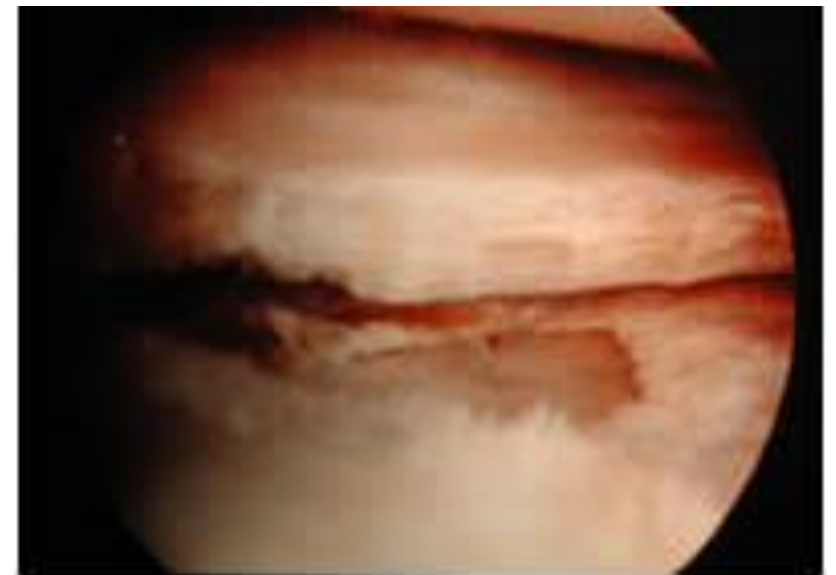
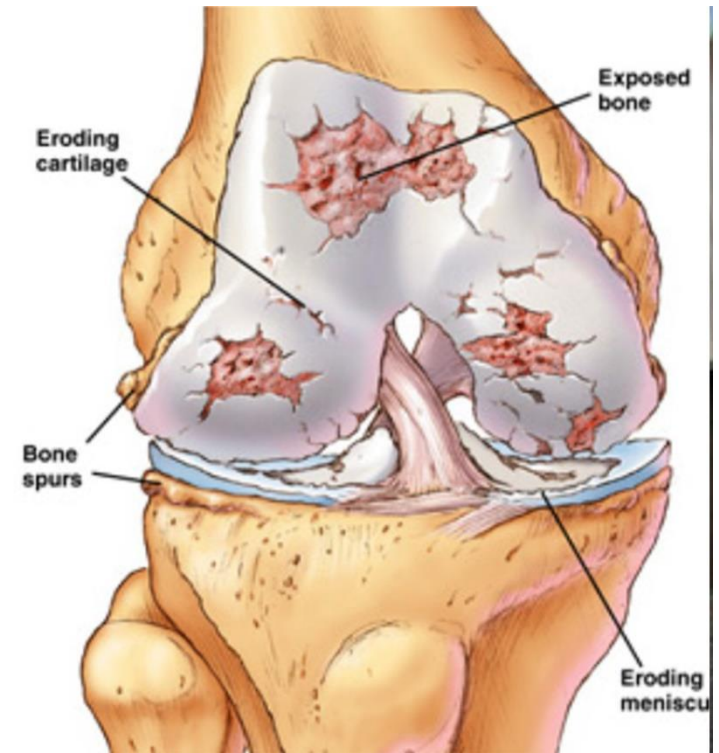
What is Hyaline Articular Cartilage?

- Functions as a **low-friction**, wear-resistant tissue designed to bear and distribute loads.
- Low metabolic activity; **no blood supply**, no lymphatic drainage, **NO NERVE SUPPLY**, poor regenerative capacity.
- Site primarily affected by degenerative osteoarthritis.



What Causes the Pain?

- **Cartilage is aneural**, so the joint pain must arise from other structures:
 - Subchondral bone: microfractures, medullary hypertension with bone angina
 - Osteophytes: stretching of nerve endings in the periosteum
 - Ligaments: stretch
 - Joint capsule: inflammation, distention
 - Synovium: inflammation
 - Periarticular muscle: spasm



Epidemiology

- Osteoarthritis is the **most common form** of arthritis in the United States.
- Osteoarthritis increases with age and is **more common in women**.
- Radiographic evidence of osteoarthritis is present in the majority of people over age 65; 80% of those over 75.
- Approximately 11% of those over 65 have symptomatic osteoarthritis of the knee.

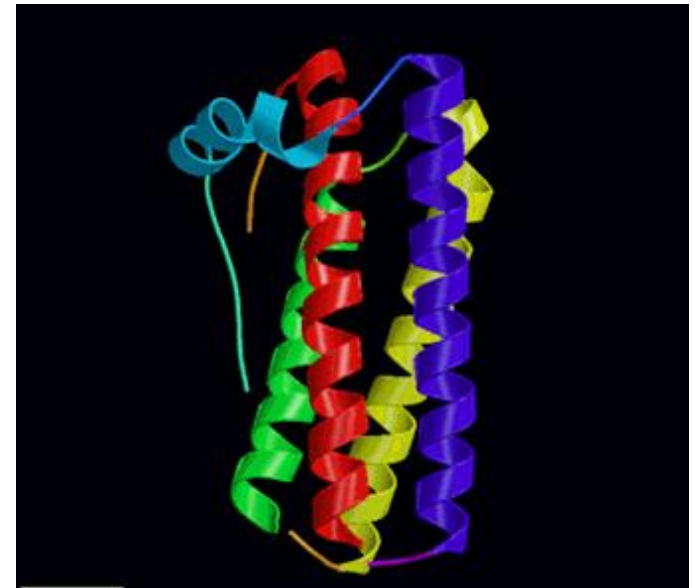
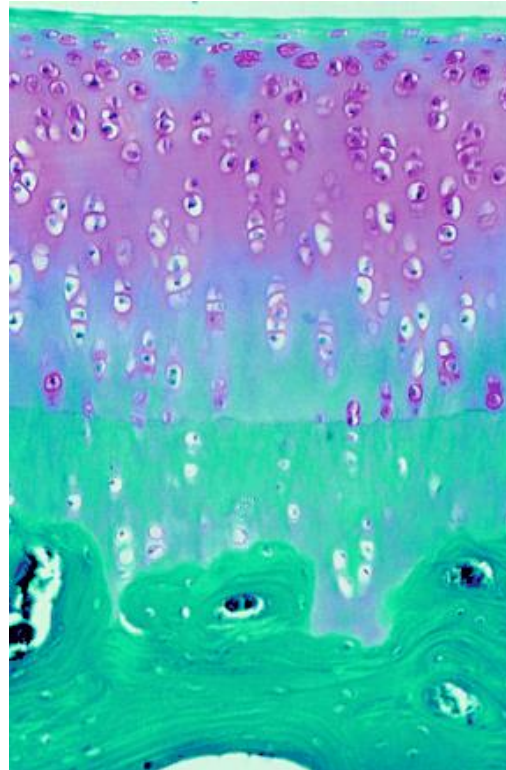


Risk Factors for Osteoarthritis



What Causes the Destruction?

- **Biomechanical Forces?**
 - OA is mechanically driven
- **Biochemical Forces?**
 - Chemically mediated
 - Cytokine activation



Associated Risk Factors

- **Risk Factors and Possible Causes:**

- **Demographic Factors:**

- **Older Age**
- **Female** versus Male Gender
- Genetics
- **Prior Joint injury**
- Anatomic Factors

- **Lifestyle Factors**

- **Obesity**
- Occupation

- **Other Possible Associations:**

- Bone Density
- **Smoking**
- Muscle weakness
- **Physical Activity**

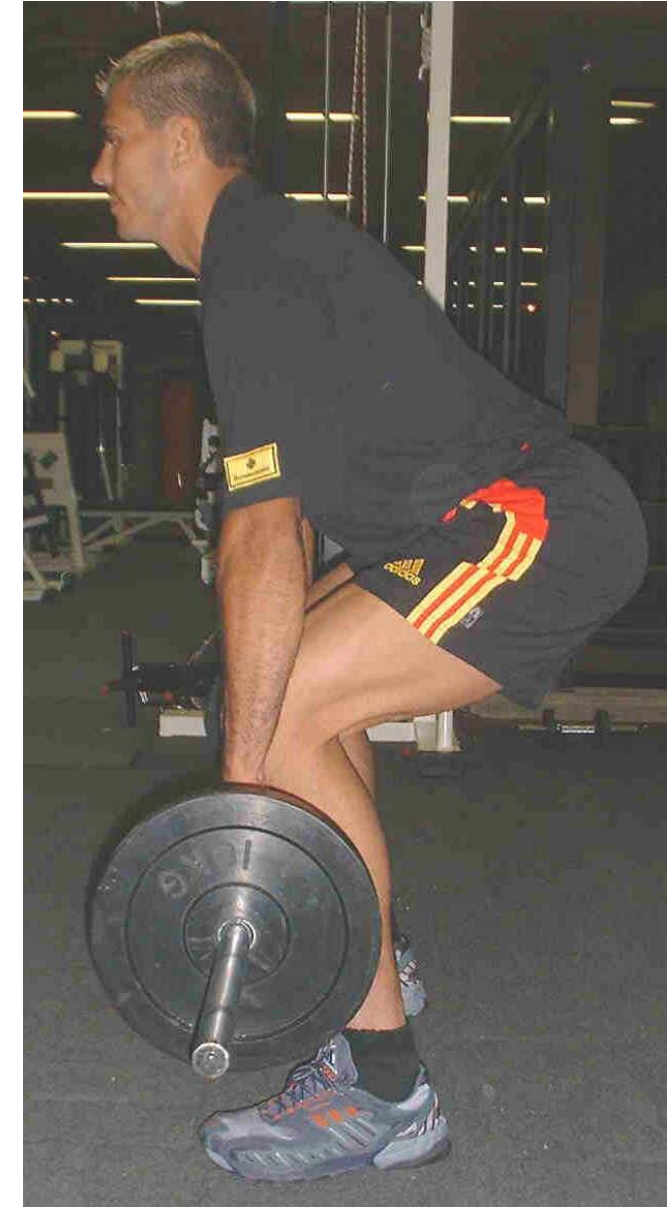


What's the Role of Exercise as a Cause of Osteoarthritis?



Does Exercise Cause Osteoarthritis?

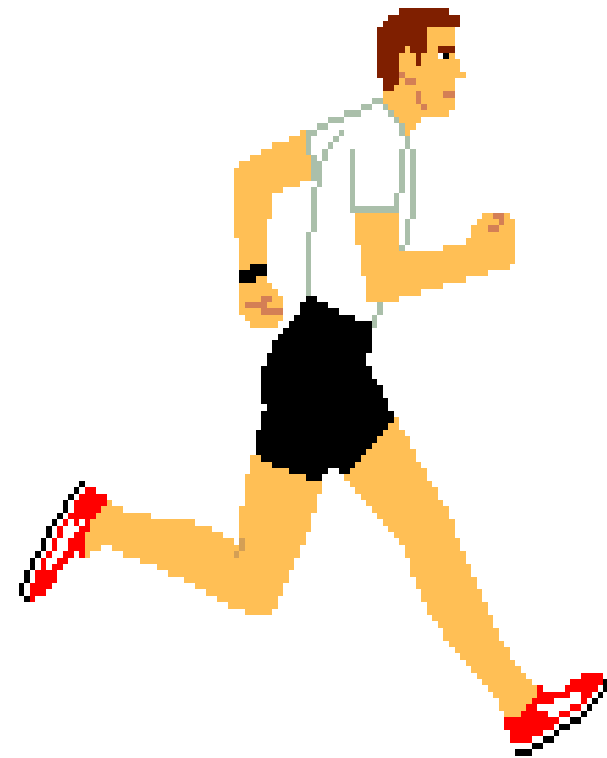
- Multiple cross sectional studies have evaluated the prevalence of OA in groups engaged in regular exercise and demonstrated an increased risk:
 - Wrestling (cervical spine, knee, elbows)
 - Cycling (patellofemoral)
 - Football (knees, feet, ankles)
 - Boxing (metacarpals)
- Increased risk studies, however, often lack of suitable control groups.
- **Longitudinal studies in runners have not demonstrated a consistent risk of arthritis.**
- Studies do, however, consistently demonstrate that **prior ligamentous or meniscal injury result in an increased risk for osteoarthritis.**



Does Exercise Cause Osteoarthritis?

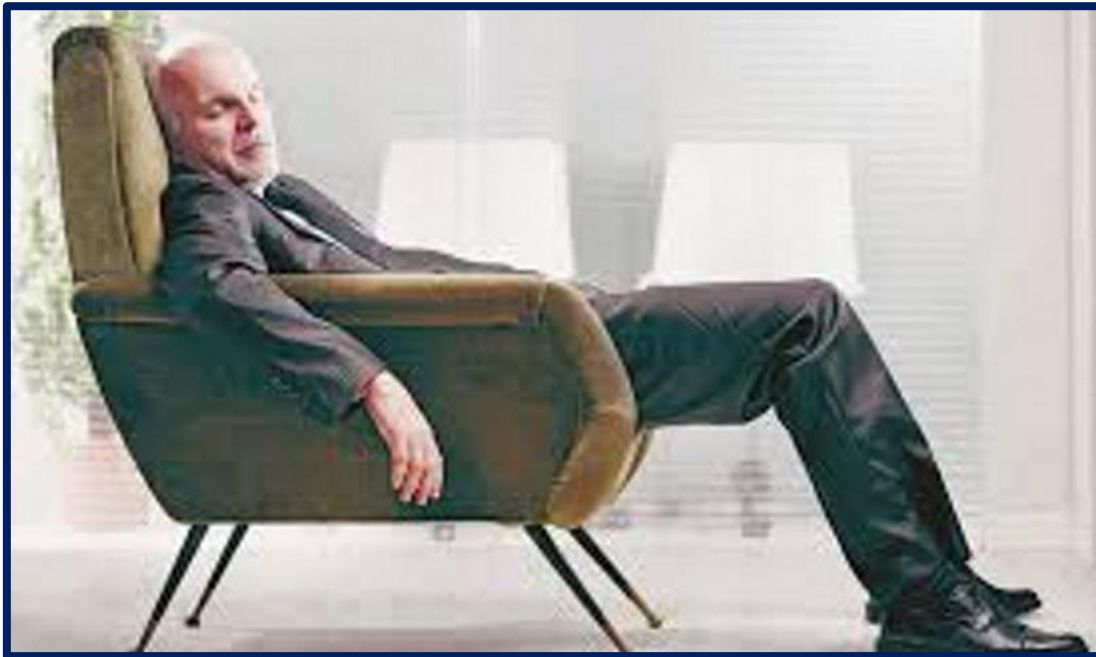
- **General Literature Consensus**

- Neuroanatomically **normal joints** are at increased **risk** of developing osteoarthritis in the **ABSENCE** of **exercise**.
- Neuroanatomically **NORMAL JOINTS ARE NOT AT INCREASED RISK** of developing osteoarthritis upon **exposure to repetitive, low impact, recreational exercise**.
- Neuroanatomically **ABNORMAL JOINTS ARE AT INCREASED RISK** of developing osteoarthritis upon **exposure to repetitive, low impact, recreational exercise**.
- Neuroanatomically **normal joints** are at increased **risk** of developing osteoarthritis upon **exposure to repetitive, high impact**.



Am I going to make my Osteoarthritis Worse?

- Arthritis is the major reason that elderly individuals are not active or limit their activity.
- **INACTIVITY dramatically increases risk of cardiovascular morbidity and mortality.**
- Several RCTs have shown that aerobic exercise can be effective in relieving symptoms of knee OA.



**"It's better to wear out than rust out."
Robert P. Nirschl, MD**

Evidence Based Management of Osteoarthritis



Current Clinical Practice Guidelines

- **American College of Rheumatology**

- www.rheumatology.org



- **American Academy of Orthopedic Surgery**

- www.aaos.org



- **European League Against Rheumatism**

- www.eular.org



fighting rheumatic & musculoskeletal
diseases together

- **Osteoarthritis Research Society International**

- www.oarsi.org



2019 American College of Rheumatology/Arthritis Foundation Guideline for the Management of Osteoarthritis of the Hand, Hip, and Knee

Sharon L. Kolasinski,¹ Tuhina Neogi,² Marc C. Hochberg,³ Carol Oatis,⁴ Gordon Guyatt,⁵ Joel Block,⁶ Leigh Callahan,⁷ Cindy Copenhaver,⁸ Carole Dodge,⁹ David Felson,² Kathleen Gellar,¹⁰ William F. Harvey,¹¹ Gillian Hawker,¹² Edward Herzig,¹³ C. Kent Khoo,¹⁴ Amanda E. Nelson,⁷ Jonathan Samuels,¹⁵ Carla Scanzello,¹ Daniel White,¹⁶ Barton Wise,¹⁷ Roy D. Altman,¹⁸ Dana DiRenzo,¹⁹ Joann Fontanarosa,²⁰ Gina Giradi,²⁰ Mariko Ishimori,²¹ Devyani Misra,² Amit Aakash Shah,²² Anna K. Shmigel,²³ Louise M. Thoma,⁷ Marat Turgunbaev,²⁴ Amy S. Turner,²² and James Reston²⁰

Guidelines and recommendations developed and/or endorsed by the American College of Rheumatology (ACR) are intended to provide guidance for patterns of practice and not to dictate the care of a particular patient. The ACR considers adherence to the recommendations within this guideline to be voluntary, with the ultimate determination regarding their application to be made by the clinician in light of each patient's individual circumstances. Guidelines and recommendations are intended to promote beneficial or desirable outcomes, but cannot guarantee any specific outcome. Guidelines and recommendations developed and endorsed by the ACR are subject to periodic revision, as warranted by the evolution of medical knowledge, technology, and practice. ACR recommendations are not intended to dictate payment or insurance decisions. These recommendations cannot adequately convey all uncertainties and nuances of patient care.

The American College of Rheumatology is an independent, professional, medical and scientific society that does not guarantee, warrant, or endorse any commercial product or service.

Objective. To develop an evidence-based guideline for the comprehensive management of osteoarthritis (OA) as a collaboration between the American College of Rheumatology (ACR) and the Arthritis Foundation, updating the 2012 ACR recommendations for the management of hand, hip, and knee OA.

Methods. We identified clinically relevant population, intervention, comparator, outcomes questions and critical outcomes in OA. A Literature Review Team performed a systematic literature review to summarize evidence supporting the benefits and harms of available educational, behavioral, psychosocial, physical, mind-body, and pharmacologic therapies for OA. Grading of Recommendations Assessment, Development and Evaluation methodology was used to rate the quality of the evidence. A Voting Panel, including rheumatologists, an internist, physical and occupational therapists, and patients, achieved consensus on the recommendations.

Results. Based on the available evidence, either strong or conditional recommendations were made for or against the approaches evaluated. Strong recommendations were made for exercise, weight loss in patients with knee and/or hip OA who are overweight or obese, self-efficacy and self-management programs, tai chi, cane use, hand orthoses for first carpometacarpal (CMC) joint OA, tibiofemoral bracing for tibiofemoral knee OA, topical nonsteroidal antiinflammatory drugs (NSAIDs) for knee OA, oral NSAIDs, and intraarticular glucocorticoid injections for knee OA. Conditional recommendations were made for balance exercises, yoga, cognitive behavioral therapy, kinesiotaping for first CMC OA, orthoses for hand joints other than the first CMC joint, patellofemoral bracing for patellofemoral knee OA, acupuncture, thermal modalities, radiofrequency ablation for knee OA, topical NSAIDs, intraarticular steroid injections and chondroitin sulfate for hand OA, topical capsaicin for knee OA, acetaminophen, duloxetine, and tramadol.

Conclusion. This guideline provides direction for clinicians and patients making treatment decisions for the management of OA. Clinicians and patients should engage in shared decision-making that accounts for patients' values, preferences, and comorbidities. These recommendations should not be used to limit or deny access to therapies.

Osteoarthritis and Cartilage

OARSI guidelines for the non-surgical management of knee, hip, and polyarticular osteoarthritis

R.R. Bannuru[†], M.C. Osani[†], E.E. Vaysbrot[†], N.K. Arden[‡], K. Bennell^{||}, S.M.A. Bierma-Zeinstra[¶], V.B. Kraus^{††}, L.S. Lohmander^{‡‡}, J.H. Abbott^{§§}, M. Bhandari^{|||}, F.J. Blanco^{¶¶}, R. Espinosa^{†††}, I.K. Haugen^{§§§}, J. Lin^{||||}, L.A. Mandl^{¶¶¶}, E. Moilanen^{###}, N. Nakamura^{††††}, L. Snyder-Mackler^{††††}, T. Trojian^{§§§§}, M. Underwood^{|||||}, T.E. McAlindon[†]

[†] Center for Treatment Comparison and Integrative Analysis (CTCIA), Division of Rheumatology, Tufts Medical Center, Boston, MA, USA

[‡] Centre for Sport, Exercise and Osteoarthritis Research Versus Arthritis, University of Oxford, Nottingham, UK

[§] MRC Lifecourse Epidemiological Unit, University of Southampton, Southampton, UK

^{||} Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, University of Melbourne, Carlton, Victoria, Australia

[¶] Department of General Practice, Erasmus MC - University Medical Centre Rotterdam, Rotterdam, the Netherlands

^{¶¶} Department of Orthopedics, Erasmus MC - University Medical Centre Rotterdam, Rotterdam, the Netherlands

^{††} Duke Molecular Physiology Institute and Division of Rheumatology, Department of Medicine, Duke University School of Medicine, Durham, NC, USA

^{‡‡} Dept. of Clinical Sciences, Orthopedics, Lund University, Lund, Sweden

^{§§} Centre for Musculoskeletal Outcomes Research (CMOR), Dept. of Surgical Sciences, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand

^{|||} Dept. of Orthopedic Surgery, McMaster University, Ontario, Canada

^{¶¶} Grupo de Investigación de Reumatología, INIBIC-Hospital Universitario, A Coruña, La Coruña, Spain

^{###} CICA-INIBIC Universidad de A Coruña, A Coruña, La Coruña, Spain

^{†††} National Institute of Rehabilitation, Mexico City, Mexico

^{§§§} National Autonomous University of Mexico, Mexico City, Mexico

^{||||} Dept. of Rheumatology, Diakonhjemmet Hospital, Oslo, Norway

^{¶¶¶} Arthritis Clinic and Research Center, Peking University People's Hospital, Peking University, Beijing, China

^{§§§§} Hospital for Special Surgery, Weill Cornell Medicine, New York, NY, USA

^{|||||} The Immunopharmacology Research Group, Faculty of Medicine and Health Technology, Tampere University and Tampere University Hospital, Tampere, Finland

^{††††} Institute for Medical Science in Sports, Osaka Health Science University, Osaka, Japan

^{‡‡‡‡} Dept. of Physical Therapy, STAR University of Delaware, Newark, DE, USA

^{§§§§§} Division of Sports Medicine, Drexel Sports Medicine, Philadelphia, PA, USA

^{||||||} Warwick Clinical Trials Unit, Warwick Medical School, Coventry, UK

^{¶¶¶¶¶} University Hospitals of Coventry and Warwickshire, Coventry, UK

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SUMMARY

Objective: To update and expand upon prior Osteoarthritis Research Society International (OARSI) guidelines by developing patient-focused treatment recommendations for individuals with Knee, Hip, and Polyarticular osteoarthritis (OA) that are derived from expert consensus and based on objective review of high-quality meta-analytic data.

Methods: We sought evidence for 60 unique interventions. A systematic search of all relevant databases was conducted from inception through July 2018. After abstract and full-text screening by two independent reviewers, eligible studies were matched to PICO questions. Data were extracted and meta-analyses were conducted using RevMan software. Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Evidence Profiles were compiled using the GRADEpro web application. Voting for Core Treatments took place first. Four subsequent voting sessions took place via anonymous online survey, during which Panel members were tasked with voting to produce recommendations for all joint locations and comorbidity classes. We designated non-Core treatments to Level 1A, 1B, 2, 3, 4A, 4B, or 5, based on the percentage of votes in favor, in addition to the strength of the recommendation.

Treatment of Osteoarthritis of the Knee: Evidence-Based Guideline, 2nd Edition

David S. Jevsevar, MD, MBA

Abstract

Treatment of Osteoarthritis of the Knee: Evidence-Based Guideline, 2nd Edition, is based on a systematic review of the current scientific and clinical research. This guideline contains 15 recommendations, replaces the 2008 AAOS clinical practice guideline, and was reevaluated earlier than the 5-year recommendation of the National Guideline Clearinghouse because of methodologic concerns regarding the evidence used in the first guideline. The current guideline does not support the use of viscosupplementation for the treatment of osteoarthritis of the knee. In addition, the work group highlighted the need for better research in the treatment of knee osteoarthritis.

Overview and Rationale

The American Academy of Orthopaedic Surgeons (AAOS), with input from representatives from the American College of Rheumatology, the American Academy of Family Physicians, and the American Physical Therapy Association, recently published their clinical practice guideline (CPG), *Treatment of Osteoarthritis of the Knee: Evidence-Based Guideline, 2nd Edition*.¹ This guideline contains 15 recommendations, replaces the 2008 AAOS CPG, and was reevaluated earlier than the 5-year recommendation of the National Guideline Clearinghouse² because of methodologic concerns regarding the evidence used in the first CPG.

Specifically, the previous AAOS guideline included evidence analysis from three sources: the Agency for Healthcare Research and Quality evidence report, "Treatment of Primary and Secondary Osteoarthritis of the

Knee";³ Osteoarthritis Research Society International guidelines;⁴ and the Cochrane Database of Systematic Reviews.⁵ As was noted by several AAOS members and industry representatives, the original guideline differed from the AAOS standard of performing an independent analysis of the available evidence. The AAOS no longer relies on previous systematic reviews in its evidence analysis because of the significant variability in the included studies, additional potential for bias, and variable clinical applicability of those reviews. These facts were highlighted in meta-analyses in joint arthroplasty by Sharma et al.⁶ The AAOS Board of Directors authorized the accelerated update based on these concerns.

The current work group used the 2008 guideline for its simulated recommendations to guide the MeSH (medical subject headings) terms used for the literature review. The work group made significant changes in the search inclusion criteria, requiring all studies to have a sample size of at least 30 par-

From Zion Orthopedics and Sports Medicine, St. George, Utah.

Dr. Jevsevar or an immediate family member is a member of a speakers' bureau or has made paid presentations on behalf of Medacta USA, has stock or stock options held in Omni Life Sciences, and has received research or institutional support from Medacta USA.

This clinical practice guideline was approved by the American Academy of Orthopaedic Surgeons on May 18, 2013.

The complete evidence-based guideline, *Treatment of Osteoarthritis of the Knee: Evidence-Based Guideline, 2nd Edition*, includes all tables, figures, and appendices, and is available at <http://www.aaos.org/guidelines>.

J Am Acad Orthop Surg 2013;21: 571-576

<http://dx.doi.org/10.5435/JAAOS-21-09-571>

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OPEN ACCESS

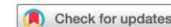
Handling editor Josef S. Smolen

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/annrheumdis-2021-220266>).

For numbered affiliations see end of article.

Correspondence to Dr Jacqueline Uson, Rheumatology Hospital Universitario Móstoles, Universidad Rey Juan Carlos, Madrid, Madrid, Spain; jusonjaeger@gmail.com

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EULAR recommendations for intra-articular therapies

Jacqueline Uson¹, Sebastián Cruz Rodríguez-García², Raul Castellanos-Moreira³, Terence W O'Neill⁴, Michael Doherty⁵, Mikael Boesen⁶, Hemant Pandit⁷, Ingrid Möller Parera⁸, Valentina Vardanyan⁹, Lene Terslev¹⁰, Willm Uwe Kampen¹¹, Maria-Antonietta D'Agostino¹², Francis Berenbaum¹³, Elena Nikiforou¹⁴, Irene A Pitsillidou¹⁵, Jenny de la Torre-Aboki¹⁶, Loreto Carmona¹⁷, Esperanza Naredo¹⁸

ABSTRACT

Objectives To establish evidence-based recommendations to guide health professionals using intra-articular therapies (IAT) in adult patients with peripheral arthropathies. **Methods** A multidisciplinary international task force established the objectives, users and scope and the need for background information, including systematic literature reviews and two surveys addressed to healthcare providers and patients throughout Europe. The evidence was discussed in a face-to-face meeting, recommendations were formulated and subsequently voted for anonymously in a three-round Delphi process to obtain the final agreement. The level of evidence was assigned to each recommendation with the Oxford levels of evidence. **Results** Recommendations focus on practical aspects to guide health professionals before, during and after IAT in adult patients with peripheral arthropathies. Five overarching principles and 11 recommendations were established, addressing issues related to patient information, procedure and setting, accuracy, routine and special aseptic care, safety issues and precautions to be addressed in special populations, efficacy and safety of repeated joint injections, use of local anaesthetics and aftercare. **Conclusion** We have developed the first evidence and expert opinion-based recommendations to guide health professionals using IAT. We hope that these recommendations will be included in different educational programmes, used by patient associations and put into practice via scientific societies to help improve uniformity and quality of care when performing IAT in peripheral adult joints.

INTRODUCTION

Intra-articular therapy (IAT) is a cornerstone procedure extensively performed by different health professionals around the world. IAT is a key for treating adults with joint synovitis, effusion and pain of different origins such as inflammatory arthritis and osteoarthritis (OA).¹ Common injectables include glucocorticoids (GC), local anaesthetics, hyaluronic acid (HA), autologous blood products and radiopharmaceuticals.²⁻⁷ Regardless of their efficacy and safety tested in clinical trials, in daily practice, a myriad of aspects may influence the outcome of IATs, such as the specific arthropathy, joint location and size, the setting and the procedure as well as the postprocedure care.

There is a wide variation in the way IAT are used and delivered in patients with arthropathies.⁸⁻⁹ Health professionals may have different views and habits depending on training and access to IATs, and individual patients also have their own needs and preferences.^{9,10}

To the best of our knowledge, no international and multidisciplinary effort has been made to develop evidence-based recommendations when performing IAT. To address this gap, EULAR (European alliance of associations for Rheumatology) established a taskforce with the aim of developing evidence-based recommendations to help guide health professionals using IAT in adult patients with peripheral arthropathies.

METHODS

The project adhered to the updated EULAR standardised operating procedures for the development of recommendations.¹¹ Methods included two face-to-face meetings, a series of systematic reviews (SR) and the production of Delphi technique-based consensus recommendations.

The task force (TF) comprised a convener (JU), co-convener (EN), methodologist (LC), 2 fellows (SCR-G and RC-M), 12 clinical experts from six European countries (rheumatologist, orthopaedic surgeon, nuclear medicine specialist and radiologist), 2 of whom belonged to EMEUNET (VV and ENi), 1 rheumatology nurse (JdIT-A), and one patient representative (IAP).

At the first face-to-face meeting, after presenting the evidence of an overview SR on the efficacy and safety of IAT,¹² the TF established the aims and scope and defined the functions, tasks and timing of the work programme, then prepared 32 'PICO' (population-intervention-comparator-outcome) questions relating to the topic area and carried out a ranking exercise to define priorities. To address the PICO questions, a series of SR were undertaken by the fellows under the supervision of the methodologist and the convenors, while an experienced librarian helped with the search strategies. Evidence was approached hierarchically by first identifying existing SR, appraising them using the AMSTAR-2 tool¹³ and subsequently identifying and appraising individual studies in the situations where an SR to address a particular PICO question was not available. The results of the SR are being published elsewhere.¹²

American College of Rheumatology Guidelines 2019

Intervention	Joint		
	Hand	Knee	Hip
Topical nonsteroidal antiinflammatory drugs			
Topical capsaicin			
Oral nonsteroidal antiinflammatory drugs			
Intraarticular glucocorticoid injection			
Ultrasound-guided intraarticular glucocorticoid injection			
Intraarticular glucocorticoid injection compared to other injections			
Acetaminophen			
Duloxetine			
Tramadol			
Non-tramadol opioids			
Colchicine			
Fish oil			
Vitamin D			
Bisphosphonates			
Glucosamine			
Chondroitin sulfate			
Hydroxychloroquine			
Methotrexate			
Intraarticular hyaluronic acid injection	(First carpometacarpal)		
Intraarticular botulinum toxin			
Prolotherapy			
Platelet-rich plasma			
Stem cell injection			
Biologics (tumor necrosis factor inhibitors, interleukin-1 receptor antagonists)			

Strongly recommended
Conditionally recommended
Strongly recommended against
Conditionally recommended against
No recommendation

Kolasinski SL, Neogi T, Hochberg MC, Oatis C, Guyatt G, Block J, Callahan L, Copenhaver C, Dodge C, Felson D, Gellar K, Harvey WF, Hawker G, Herzig E, Kwoh CK, Nelson AE, Samuels J, Scanzello C, White D, Wise B, Altman RD, DiRenzo D, Fontanarosa J, Giradi G, Ishimori M, Misra D, Shah AA, Shmagel AK, Thoma LM, Turgunbaev M, Turner AS, Reston J. 2019 American College of Rheumatology/Arthritis Foundation Guideline for the Management of Osteoarthritis of the Hand, Hip, and Knee. *Arthritis Rheumatol*. 2020 Feb;72(2):220-233.

Osteoarthritis Research Society International 2019

Table II
Recommended treatments, by level, for knee osteoarthritis

Recommendation level	Strength	Treatment type	No comorbidities	Gastrointestinal	Cardiovascular	Frailty	Widespread pain/depression
CORE	Strong	Arthritis Education; Structured Land-Based Exercise Programs (Type 1- strengthening and/or cardio and/or balance training/neuromuscular exercise OR Type 2- Mind-body Exercise including Tai Chi or Yoga) with or without Dietary Weight Management					
Level 1A High Consensus ≥75% "in favor"	Strong	Pharmacologic Non-Pharmacologic	Topical NSAIDs <i>refer to Level 1B</i>	Topical NSAIDs <i>refer to Level 1B</i>		Topical NSAIDs <i>refer to Level 1B</i>	<i>refer to Level 1B</i> <i>refer to Level 1B</i>
Level 1B High Consensus ≥75% "in favor" & >50% "conditional" <i>Recommendation</i>	Conditional	Pharmacologic Non-Pharmacologic	<ul style="list-style-type: none"> • Non-selective NSAIDs • Non-selective NSAID + PPI • COX-2 Inhibitors IACS Aquatic Exercise, Gait Aids, Self-Management Programs	COX-2 Inhibitors IACS, IAHA Aquatic Exercise, Gait Aids, Self-Management Programs	IACS, IAHA	IACS, IAHA	<ul style="list-style-type: none"> • Non-selective NSAIDs • Non-selective NSAID + PPI • COX-2 Inhibitors Aquatic Exercise, Cognitive Behavioral Therapy (with or without Exercise), Self-Management Programs, Gait Aids
Level 2 Low Consensus 60%-74% "in favor"	Conditional	Pharmacologic Non-Pharmacologic	IAHA Cognitive Behavioral Therapy with Exercise	Non-selective NSAID + PPI Cognitive Behavioral Therapy with Exercise	<i>see below</i>	<i>see below</i> Cognitive Behavioral Therapy with Exercise	Duloxetine, IACS, IAHA, Topical NSAIDs <i>none recommended</i>
Good Clinical Practice Statements	Conditional	Various	Intra-articular (IA) treatment	IA treatment, NSAID risk mitigation		IA treatment, NSAID risk mitigation	Pain management program, IA treatment

IA treatment: Intra-articular corticosteroids (IACS) are conditionally recommended for acute (1–2 weeks) and short-term (4–6 weeks) pain relief; Intra-articular Hyaluronic Acid (IAHA) is conditionally recommended for longer term treatment effect, as it was associated with symptom improvement beyond 12 weeks and demonstrated a favorable safety profile.

NSAID risk mitigation: In situations where the patient and physician choose to proceed with an oral NSAID treatment regimen despite a lack of recommendation, we suggest using the lowest possible dose of oral NSAID for shortest treatment duration along with gastric protection with a PPI²³.

Pain management program: Based on clinical assessment, it may be appropriate to refer individuals of this phenotype to a multidisciplinary chronic/widespread pain management program.

Bannuru RR, Osani MC, Vaysbrot EE, Arden NK, Bennell K, Bierma-Zeinstra SMA, Kraus VB, Lohmander LS, Abbott JH, Bhandari M, Blanco FJ, Espinosa R, Haugen IK, Lin J, Mandl LA, Moilanen E, Nakamura N, Snyder-Mackler L, Trojjan T, Underwood M, McAlindon TE. OARSI guidelines for the non-surgical management of knee, hip, and polyarticular osteoarthritis. *Osteoarthritis Cartilage*. 2019 Nov;27(11):1578-1589.

European League Against Rheumatism 2021

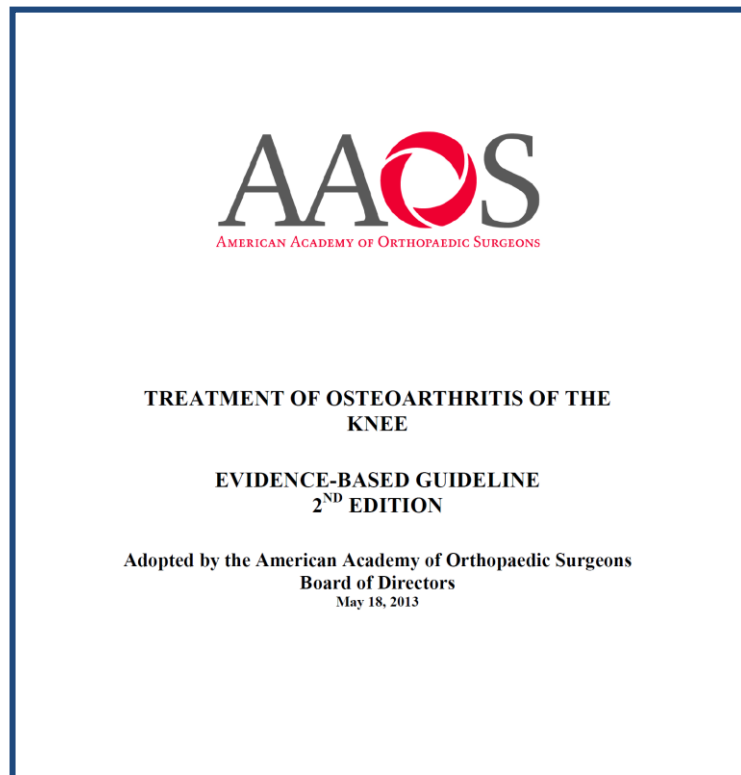
Recommendations	A (%)	LE	GR
1.The patient must be fully informed of the nature of the procedure, the injectable, and potential benefits and risks; informed consent should be obtained and documented according to local habits.	99	4	D
<ul style="list-style-type: none"> ▶ An optimal setting for IAT includes:Professional, clean, quiet, private, well-lightened room. ▶ Patient in an appropriate position, ideally on a couch/examination table, easy to lie flat. ▶ Equipment for aseptic procedures. ▶ Aid from another HP. ▶ Resuscitation equipment close-by. 	85	4	D
3.Accuracy depends on the joint, route of entry, and health professional expertise; if available, imaging guidance, for example, ultrasound, may be used to improve accuracy.	93	1B-2A	B
4.During pregnancy when injecting a joint one has to take into account whether the compound is safe for mother and baby.	98	4	D
5.Aseptic technique should always be undertaken when performing IAT.	98	3	C
6.Patients should be offered local anaesthetic explaining pros and cons.	75	3-4	D
7.Diabetic patients, especially those with suboptimal control, should be informed about the risk of transient increased glycaemia following IA GC and advised about the need to monitor glucose levels particularly from first to third day.	97	1B	A
8.IAT is not a contraindication in people with clotting/bleeding disorders or taking antithrombotic medications, unless bleeding risk is high.	89	3	C
9.IAT may be performed at least 3 months prior to joint replacement surgery, and may be performed after joint replacement following consultation with the surgical team.	88	3	C
10.The shared decision to reinject a joint should take into consideration benefits from previous injections and other individualised factors (eg, treatment options, compound used, systemic treatment, comorbidities...).	93	2	B
11.Avoid overuse of injected joints for 24 hours following IAT; however, immobilisation is discouraged.	94	1B	A

A, agreement; GR, grade of recommendation; IAGC, intra-articular glucocorticoids; IAT, intra-articular therapies; LE, level of evidence.

Uson J, Rodriguez-García SC, Castellanos-Moreira R, O'Neill TW, Doherty M, Boesen M, Pandit H, Möller Parera I, Vardanyan V, Terslev L, Kampen WU, D'Agostino MA, Berenbaum F, Nikiphorou E, Pitsillidou IA, de la Torre-Aboki J, Carmona L, Naredo E. EULAR recommendations for intra-articular therapies. Ann Rheum Dis. 2021 May 25;annrheumdis-2021-220266.

Managing Osteoarthritis of the Knee in the United States AAOS 2013

- “GO TO” therapy is **strength training, NSAIDs** and then a **total joint replacement!**

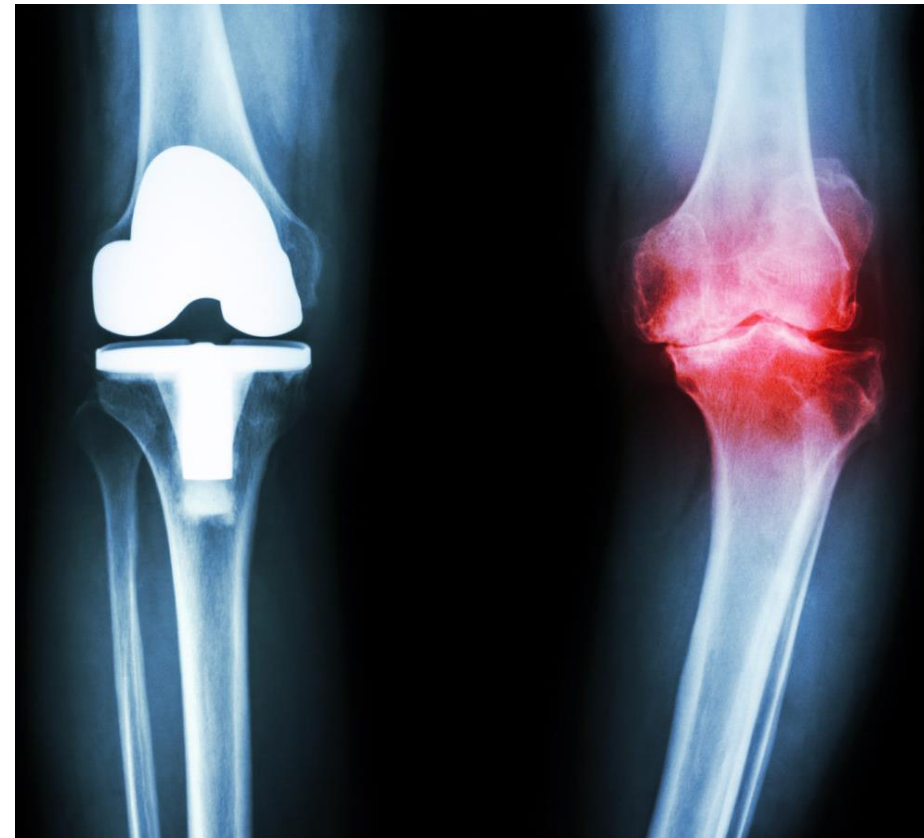


American Family Physician

Osteoarthritis: Rapid Evidence Review

Mark H. Ebell, MD, MS, University of Georgia College of Public Health, Athens, Georgia

Osteoarthritis (OA) should be suspected in patients with pain in the fingers, shoulders, hips, knees, or ankles, especially if they are older than 40 years. Patients older than 50 years who have joint pain, minimal morning stiffness, and functional impairment likely have OA. Radiography can confirm the diagnosis and may be helpful before surgical referral, but findings generally do not correlate well with symptoms. Exercise, physical therapy, knee taping, and tai chi are beneficial for knee OA. Medical therapy provides modest benefits in pain reduction and functional improvement; however, nonsteroidal anti-inflammatory drugs, tramadol, and other opioids have significant potential harms. Joint replacement may be considered for patients with moderate to severe pain and radiographically confirmed OA. Corticosteroid injections may be helpful in the short term. Vitamin D supplements, shoes specifically designed for persons with OA, antioxidant supplements, physical therapy for hip OA, ionized wrist bracelets, lateral wedge insoles for medial knee OA, and hyaluronic acid injections are not effective. (*Am Fam Physician*. 2018;97(8):523-526. Copyright © 2018 American Academy of Family Physicians.)



Ebell MH: Osteoarthritis: Rapid Evidence Review American Family Physician. 2018 Apr 15;97(8):523-526.

**What's
Constitutes a
Good
Diagnostic
Assessment?**



The History and Physical of the Patient with Osteoarthritis

- **Objectives:**
 - Confirm the diagnosis
 - Identify risk factors
 - Assess function
 - Assess comorbidities
 - Assess patient goals



Confirm the Diagnosis

- **History**
 - Family history
 - Disability
 - Mechanical symptoms
- **Physical**
 - Distribution
 - Alignment
 - Effusion
 - Range of Motion
 - Quadriceps Strength
 - Extra-articular manifestations
- **Radiographs**
 - Weight bearing
 - 45 degree Flexion
- **Synovial Fluid**
 - Crystals
- **Labs**
 - Rheumatoid panel

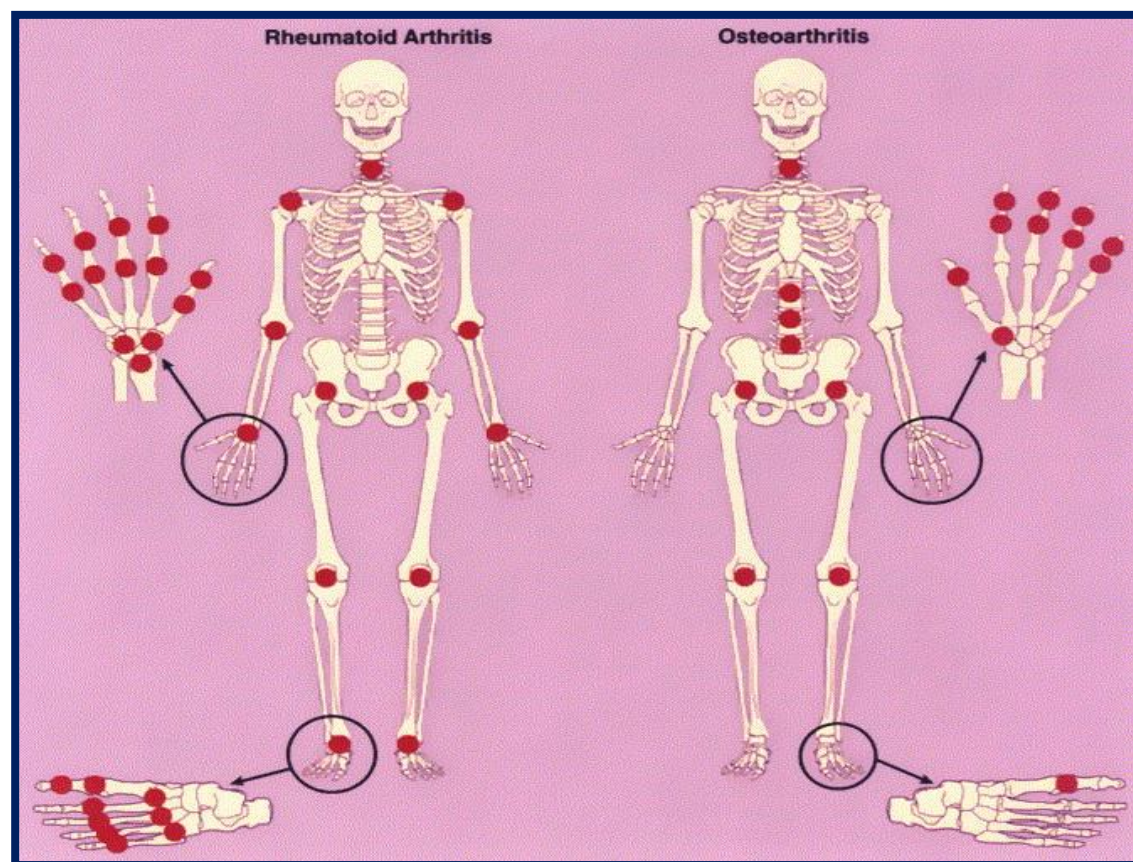


Clinical Signs and Symptoms

SIGNS AND SYMPTOMS

Signs and symptoms that are common in OA include:

- Pain that is typically worse later in the day and relieved by rest.
- Joint swelling and tenderness, with or without crepitus.
- Bony enlargement in prolonged or severe OA.
- Joint pain, minimal morning stiffness, and functional impairment in patients older than 50 years.^{2,3} The presence of these findings is moderately helpful in ruling in OA, but their absence does not rule it out³ (*Table 2*⁴).
- Older age, obesity, difficulty walking down stairs, and clinical findings of decreased range of motion, effusion, and crepitus in patients with knee pain.⁵

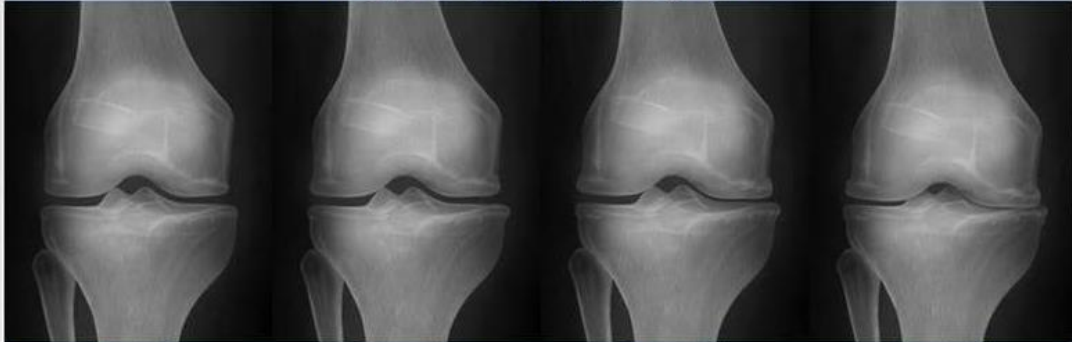


Ebell MH: Osteoarthritis: Rapid Evidence Review American Family Physician. 2018 Apr 15;97(8):523-526.

Diagnostic Imaging

DIAGNOSTIC TESTING

- Radiography is not required to diagnose OA in patients with risk factors and typical symptoms.³
- Radiographic findings in patients with OA do not always correlate well with symptoms. Two studies found that only 16% of patients with frequent hip pain had radiographic evidence of OA; conversely, only 21% of patients who met the radiographic criteria for hip OA had frequent pain.⁶
- Typical radiographic findings in patients with OA include joint space narrowing, osteophytes, and subchondral sclerosis.
- Radiography can be helpful before referral for joint replacement, as radiographic severity is an important factor in determining whether surgery is appropriate.
- Magnetic resonance imaging detects joint abnormalities in about 90% of both obese and nonobese adults older than 50 years who do not have joint pain.⁷

Kellgren-Lawrence (KL) grading scale					
					
	Grade 1	Grade 2	Grade 3	Grade 4	
CLASSIFICATION	Normal	Doubtful	Mild	Moderate	Severe
DESCRIPTION	No features of OA	Minute osteophyte: doubtful significance	Definite osteophyte: normal joint space	Moderate joint space reduction	Joint space greatly reduced: subchondral sclerosis

Ebell MH: Osteoarthritis: Rapid Evidence Review American Family Physician. 2018 Apr 15;97(8):523-526.

Diagnostic Pitfalls

- **Diagnostic Pitfalls**
 - **Referred pain**
 - Pes anserine bursitis
 - Neuropathy
 - Radiculopathy
 - Other joint with osteoarthritis
 - **Some other form of arthritis**
 - Rheumatoid
 - Septic
 - Gouty
 - **Secondary soft tissue rheumatism**
 - Enthesopathy
 - Ligamentous instability
 - Bursitis
 - **Other**
 - Avascular necrosis
 - Tumor



Management: The Role of Non-Pharmacologic Therapy



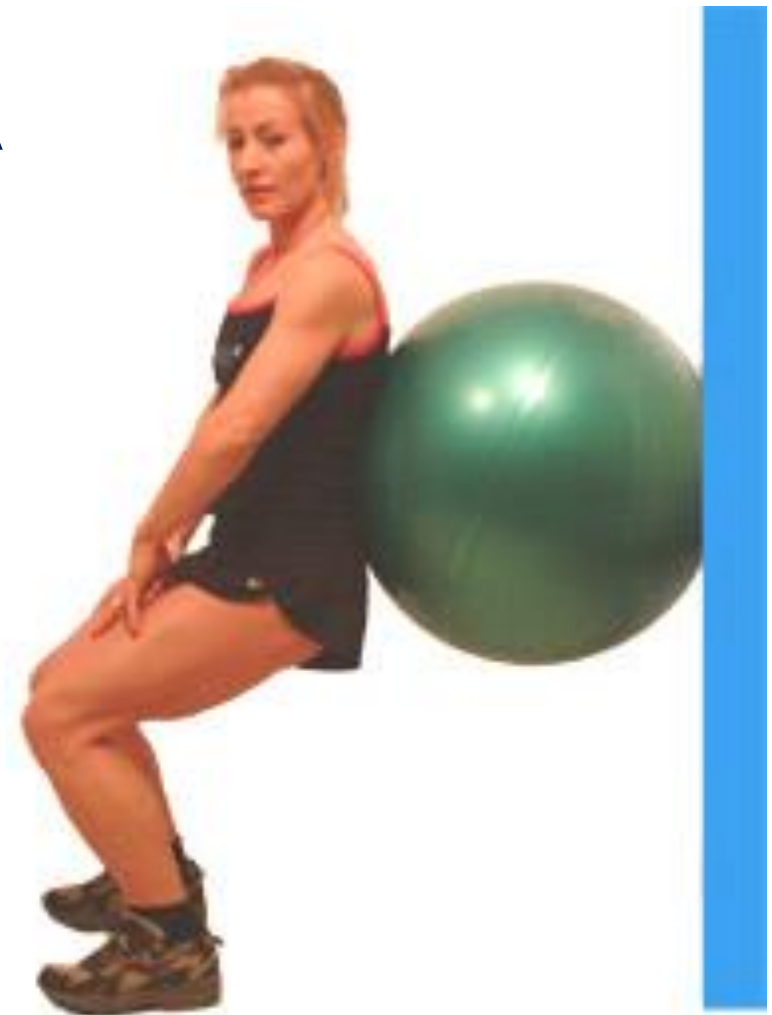
Non-Pharmacologic Therapy for Osteoarthritis

- Aquatic exercise has small short-term benefits for OA.⁸
- Vitamin D supplements, antioxidant supplements, shoes specifically designed for persons with OA, and ionized wrist bracelets are ineffective for OA.⁹⁻¹³
- Exercise, tai chi, knee taping, and physical therapy are beneficial for knee OA and can be recommended based on patient preference and acceptability.¹⁴⁻¹⁸

**Ebell MH: Osteoarthritis: Rapid Evidence Review American
Family Physician. 2018 Apr 15;97(8):523-526.**

Which Exercises help Manage Osteoarthritis?

- **Cochrane Data Base:**
 - Both high intensity and low intensity aerobic exercise appear to be equally effective in improving a patient's functional status, gait, pain and aerobic capacity for people with OA of the knee
 - Land-based therapeutic exercise was shown to reduce pain and improve physical function for people with OA of the knee. There were insufficient data to provide useful guidelines on optimal exercise type or dosage.
- Multiple studies have demonstrated that **quadriceps strengthening** exercises can increase strength and;
 - Decrease dependency
 - Improve function with ADLs
 - Decrease pain.



Non-Pharmacologic Therapy for Osteoarthritis

- Lateral wedge insoles are ineffective for medial knee OA.¹⁹
- Knee bracing has insufficient evidence to draw conclusions about its effectiveness.²⁰
- Physical therapy was not beneficial for hip OA in a well-designed trial.²¹
- Weight loss has been recommended for patients with knee and hip OA²²; however, a systematic review found only low-quality evidence that bariatric surgery reduces pain and improves function in morbidly obese persons with knee pain.²³



Ebell MH: Osteoarthritis: Rapid Evidence Review American Family Physician. 2018 Apr 15;97(8):523-526.

Does Losing Weight Affect Risk?

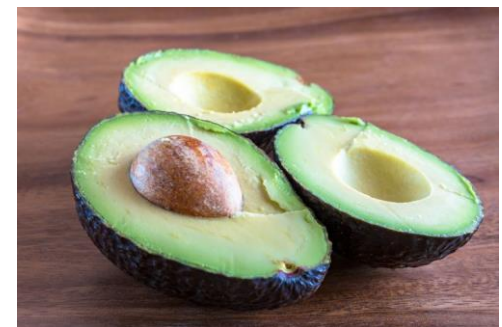
- For a woman of normal height, weight loss of only 5kg reduces the risk of OA by more than 50%.
- Estimated that substantial weight loss e.g. obese to overweight, or overweight to normal weight, could prevent 33% of OA in women and 20% in men.



**Felson et al: Obesity and knee osteoarthritis.
Annals of Internal Medicine 1998.**

Non-Pharmacologic Therapy for Osteoarthritis

- Ginger consumption significantly reduced pain and disability in five studies (N = 593) included in a systematic review.²⁴ However, patients were more likely to stop taking it, and the overall quality of studies was moderate. Similarly, avocado unsaponifiables may be effective at dosages of 300 to 600 mg per day. Both of these interventions, although likely safe, are limited by the small number and methodologic flaws of studies.²⁵



Ebell MH: Osteoarthritis: Rapid Evidence Review American Family Physician. 2018 Apr 15;97(8):523-526.

Management: The Role of Medical Therapy



Nonsteroidal Anti-inflammatory Medications

- Acetaminophen is less effective than nonsteroidal anti-inflammatory drugs (NSAIDs) for OA, but given its safety, a trial at an adequate dosage is appropriate.^{26,27}
- Of the NSAIDs currently available in the United States, diclofenac, 150 mg per day, is most likely to be effective for OA, followed by naproxen, according to a systematic review.²⁶ A Cochrane review concluded that topical diclofenac and ketoprofen are moderately effective.²⁸
- Topical capsaicin appeared to be somewhat effective in several small trials, although it is associated with a transient burning sensation.²⁹⁻³²



Ebell MH: Osteoarthritis: Rapid Evidence Review American Family Physician. 2018 Apr 15;97(8):523-526.

Re-Thinking the NSAIDs

Other Medications

Systematic reviews and meta-analyses of randomized trials of acetaminophen in persons with knee osteoarthritis suggest minimal efficacy.³⁹⁻⁴¹

Topical Medications

A meta-analysis of seven randomized, controlled trials¹² showed a benefit of treatment with topical nonsteroidal antiinflammatory drugs (NSAIDs) similar to that with oral NSAIDs but with fewer adverse effects. Their use should precede use of oral NSAIDs, although they are less practical when more than one joint is involved. The use of



**Sharma L. Osteoarthritis of the Knee. N Engl J Med. 2021
Jan 7;384(1):51-59.**

Tramadol and Duloxetine

- Tramadol is moderately effective for OA, according to a systematic review of 11 randomized trials (N = 1,019), and has a number needed to treat (NNT) of 6 for one person to report at least moderate improvement.³³ Conversely, the number needed to harm (NNH) for one person to stop taking tramadol because of adverse effects is 8.
- Duloxetine (Cymbalta) is a serotonin–norepinephrine reuptake inhibitor approved for treatment of painful conditions. Its NNT is 7 for clinically significant pain reduction in OA.^{34,35} The most common adverse effect is mild to moderate nausea (23% vs. 7% for placebo; NNH = 6).³⁶
- Because tramadol and duloxetine have harms and adverse effects similar in magnitude to their potential benefits, they should be used only in select patients.



Ebell MH: Osteoarthritis: Rapid Evidence Review American Family Physician. 2018 Apr 15;97(8):523-526.

Narcotic Medication

- Propoxyphene (not available in the United States) plus acetaminophen is no better than acetaminophen alone, has more adverse effects, and should be avoided.³⁷
- Oral and transdermal opioids (not including tramadol) have only modest benefits that are of questionable clinical significance, according to a Cochrane review.³⁸ These medications also have significant adverse effects, and long-term use is discouraged. Patients taking opioids should be closely monitored, and the dose should be kept as low as possible. Daily dosages of more than 50 mg of hydrocodone or 30 mg of oxycodone are discouraged.³⁹



Ebell MH: Osteoarthritis: Rapid Evidence Review American Family Physician. 2018 Apr 15;97(8):523-526.

Making Sense of Oral Medications: UpToDate 2021

- In patients with one or a few joints affected, especially knee and/or hand OA, we initiate pharmacotherapy with **topical NSAIDs** due to their similar efficacy compared with oral NSAIDs and their better safety profile.
- We use **oral NSAIDs** in patients with inadequate symptom relief from topical NSAIDs, symptomatic OA in multiple joints, and/or patients with hip OA. We use the **lowest dose** required to control the patient's symptoms on **an as-needed basis**.
- We use **duloxetine** for patients with OA in multiple joints and concomitant comorbidities that may contraindicate oral NSAIDs and for patients with knee OA who have not responded satisfactorily to other interventions.
- We **do not routinely use intraarticular glucocorticoid injection** due to the short duration of its effects (ie, approximately four weeks) and evidence that it **may have deleterious effects on the hyaline cartilage** and may accelerate OA progression.
- Due to safety concerns pertaining to the use of **acetaminophen** and increased awareness of its negligible and non-clinically significant effects on pain, this **medication is no longer considered the first-line analgesic** for the treatment of knee and hip OA by clinical guidelines and is no longer being initiated in our practice
- The benefit of intraarticular **hyaluronic acid (HA)** is **also controversial for knee** and hip OA, and most evidence demonstrates only a small superiority over intraarticular placebo.
- We **avoid prescribing opioids** due to their overall small effects on pain over placebo and potential side effects, especially for long-term use and in the older adult population.

What about the Role of Steroid Injections?



Steroid Injections

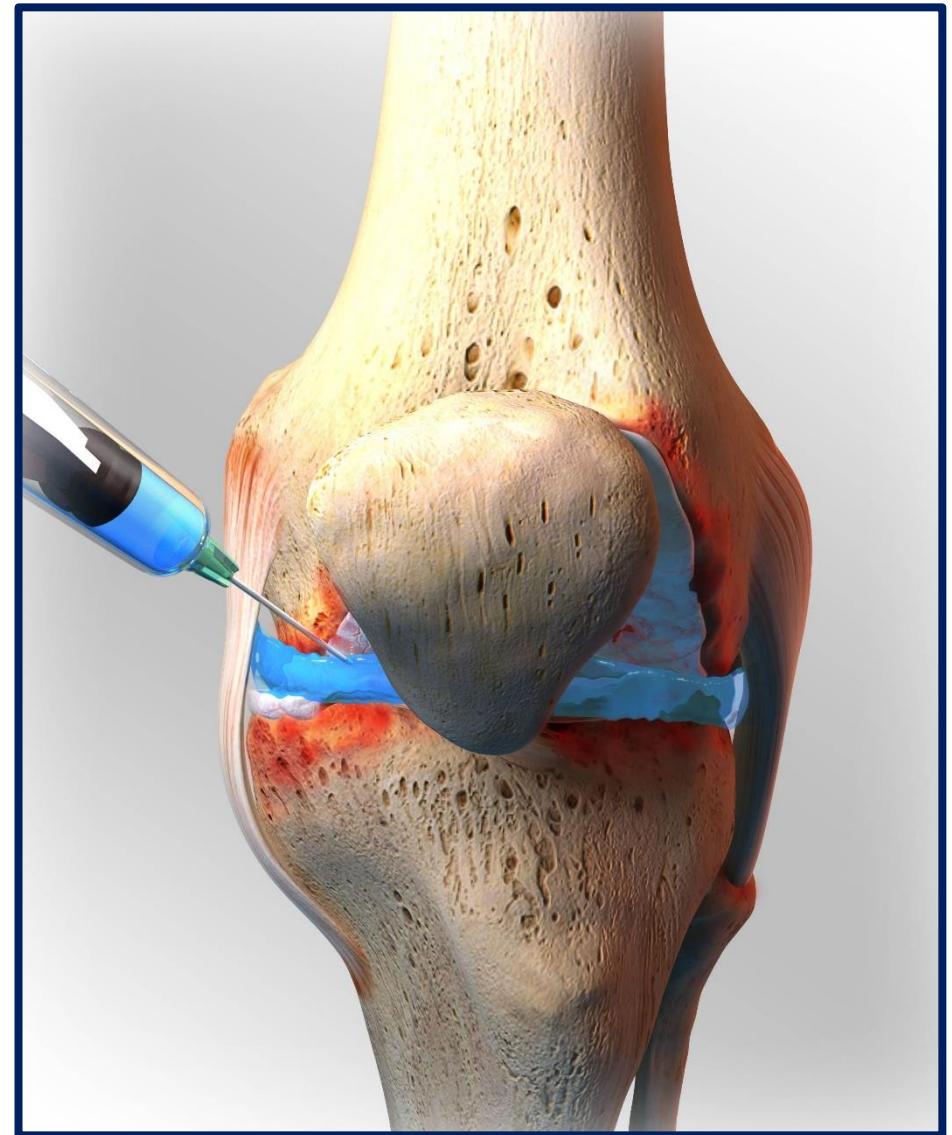
How they Might Work

- **Mechanism of action is unknown,** however:
 - Inhibit accumulation of inflammatory cell lines
 - Reduction of prostaglandin synthesis
 - Inhibit leukocyte secretion from synovial cells
 - Decrease interleukin secretion by the synovium
 - Increase viscosity of synovial fluid



Steroid Injections

- **Systemic corticosteroid therapy** has no place in the treatment of osteoarthritis.
- Generally employed **no more than 3 to 4 times per year** secondary to risks of direct articular cartilage damage; however, some argue the steroid may prevent the biochemical degradation.
- Variable duration of activity modification after injection.
- **Not clear who will benefit from a steroid injection**; some authors recommend the patient with an effusion or acute synovitis.



Steroid Injections: The Evidence

- **Cochrane Review** of intra-articular injections in the knee in osteoarthritis (2015).

Based on the evidence, intra-articular corticosteroids may cause a moderate improvement in pain and a small improvement in physical function, but the quality of the evidence is low and results are inconclusive. Intra-articular corticosteroids appear to cause as many side effects as a placebo.

- “There is no clear objective evidence for intra-articular corticosteroid injections on the treatment of osteoarthritic or sports related injuries of the knee...”

Jüni P, Hari R, Rutjes AWS, Fischer R, Silletta MG, Reichenbach S, da Costa BR. Intra-articular corticosteroid for knee osteoarthritis. Cochrane Database of Systematic Reviews 2015, Issue 10.

Who Deserves an Injection?

- **AAOS**

- **Inflamed knees** respond best to injections.
- Localized knee pain felt only with weight-bearing is less likely to respond.

- **ACR**

- Intraarticular glucocorticoid injections are of value in the treatment of acute knee pain in patients with, and may be particularly beneficial in patients **who have signs of local inflammation** with a joint effusion.

- **EULAR**

- Intra-articular injection of long acting steroid is indicated for **acute exacerbation of knee pain, especially if accompanied by effusion.**



What about Complementary Therapy?



Complementary Therapy: What's the Evidence

- Acupuncture is at best minimally effective for OA of the knee or hip.⁵⁷⁻⁵⁹
- Oral glucosamine with or without chondroitin does not appear to be effective in well-designed trials.⁶⁰⁻⁶²
- S-adenylmethionine and methylsulfonylmethane have uncertain effectiveness based on systematic reviews.^{63,64} Observed benefits were small in magnitude and probably not clinically significant.



Ebell MH: Osteoarthritis: Rapid Evidence Review American Family Physician. 2018 Apr 15;97(8):523-526.

What About Hyaluronic Products and Prolotherapy?



Hyaluronan Products

- **Mechanism of Action:**

- The **predominant mechanism** of intra-articular hyaluronan (hyaluronic acid) (HA) for the treatment of pain associated with knee osteoarthritis (OA) **is UNKNOWN**, in vivo, in vitro, and clinical studies demonstrate various physiological effects of exogenous HA.
- HA can **reduce nerve impulses** and nerve sensitivity associated with the pain of OA.
- Exogenous HA **enhances chondrocyte HA and proteoglycan synthesis**, reduces the production and activity of proinflammatory mediators and matrix metalloproteinases, and alters the behavior of immune cells.
- Many of the physiological effects of exogenous HA **may be a function of its molecular weight**.

Moreland LW: Intra-articular hyaluronan (hyaluronic acid) and hylans for the treatment of osteoarthritis: mechanisms of action. Arthritis Rs Ther. 2003;5(2):54.

Hyaluronan Products

- We performed a network meta-analysis (NMA) of the relevant literature to determine if there is a benefit from HA as compared with IAS and IAP.
- 11 papers met the inclusion criteria from the search strategy.
- On NMA, those participants receiving HA were 15% and 11% more likely to respond to treatment by OMERACT-OARSI criteria than those receiving IAS or IAP, respectively ($p < 0.05$ for both).
- In the light of the aforementioned results of our NMA, the **American Medical Society for Sport Medicine recommends the use of HA for the appropriate patients with knee OA.**



Trojian TH, Concoff AL, Joy SM, Hatzenbuehler JR, Saulsberry WJ, Coleman CI. AMSSM scientific statement concerning viscosupplementation injections for knee osteoarthritis: importance for individual patient outcomes. Br J Sports Med. 2016 Jan;50(2):84-92.

What is Prolotherapy?

- Prolotherapy is injection of an irritant solution (often a form of sugar called dextrose) into joints, ligaments, and tendons.



Mechanism of Action

- Dr. Rabago said the mechanism of action behind the prolotherapy effect is UNKNOWN but might involve "a local response which boosts the native healing reaction, possibly by an inflammatory or pain-specific mechanism."

Rabago D, Patterson JJ, Mundt M, Kijowski R, Grettie J, Segal NA, Zgierska A. Dextrose prolotherapy for knee osteoarthritis: a randomized controlled trial. Ann Fam Med. 2013 May-Jun;11(3):229-37.



How is it Administered?

- Intra-articular:
 - 10 ml syringe with 5 ml D50 and 5 ml of lidocaine 1%: 6ml injected (25% soln)
- Extra-articular:
 - Up to 22.5 ml of a 15% dextrose solution: .5 ml injections at bone tendon interfaces.
 - Recipe:
 - 6.75 mL 50% dextrose
 - 4.5 mL 1% lidocaine
 - 11.25 mL 0.9% saline

Dextrose Prolotherapy for Knee Osteoarthritis: A Randomized Controlled Trial

David Rabago, MD*

Jeffrey J. Patterson, DO*

Marlon Mundi, PhD*

Richard Kijowski MD*

Jessica Grettie, BS*

Neil A. Segal, MD, MS*

Aleksandra Zgierska MD, PhD*

*Department of Family Medicine, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin

*Department of Radiology, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin

*Departments of Orthopaedics & Rehabilitation, Epidemiology, and Radiology, The University of Iowa, Iowa City, Iowa

ABSTRACT

PURPOSE Knee osteoarthritis is a common, debilitating chronic disease. Prolotherapy is an injection therapy for chronic musculoskeletal pain. We conducted a 3-arm, blinded (injector, assessor, injection group participants), randomized controlled trial to assess the efficacy of prolotherapy for knee osteoarthritis.

METHODS Ninety adults with at least 3 months of painful knee osteoarthritis were randomized to blinded injection (dextrose prolotherapy or saline) or at-home exercise. Extra- and intra-articular injections were done at 1, 5, and 9 weeks with as-needed additional treatments at weeks 13 and 17. Exercise participants received an exercise manual and in-person instruction. Outcome measures included a composite score on the Western Ontario McMaster University Osteoarthritis Index (WOMAC; 100 points); knee pain scale (KPS; individual knee), post-procedure opioid medication use, and participant satisfaction. Intention-to-treat analysis using analysis of variance was used.

RESULTS No baseline differences existed between groups. All groups reported improved composite WOMAC scores compared with baseline status ($P < .01$) at 52 weeks. Adjusted for sex, age, and body mass index, WOMAC scores for patients receiving dextrose prolotherapy improved more ($P < .05$) at 52 weeks than did scores for patients receiving saline and exercise (score change: 15.3 ± 3.5 vs 7.6 ± 3.4 , and 8.2 ± 3.3 points, respectively) and exceeded the WOMAC-based minimal clinically important difference. Individual knee pain scores also improved more in the prolotherapy group ($P = .05$). Use of prescribed postprocedure opioid medication resulted in rapid diminution of injection-related pain. Satisfaction with prolotherapy was high. There were no adverse events.

CONCLUSIONS Prolotherapy resulted in clinically meaningful sustained improvement of pain, function, and stiffness scores for knee osteoarthritis compared with blinded saline injections and at-home exercises.

Ann Fam Med 2013;11:229-237. doi:10.1370/afm.1504.

INTRODUCTION

Knee osteoarthritis is a chronic disease resulting in joint pain, stiffness, and decreased function.¹ It is common, expensive for patients² and society, and age-related³, by age 65 years, most of the population has radiographic evidence of osteoarthritis.⁴ Sources of pain include intra-articular and supportive extra-articular structures.^{5,6} Standard-of-care is multidisciplinary, however, a recent systematic review reported no clear benefit of any one therapy.⁷ Conservative therapies⁸ and oral supplements⁹ have been evaluated but are without clear efficacy. The Agency for Healthcare Research and Quality has called for the development of new therapies to prevent and treat knee osteoarthritis.⁴

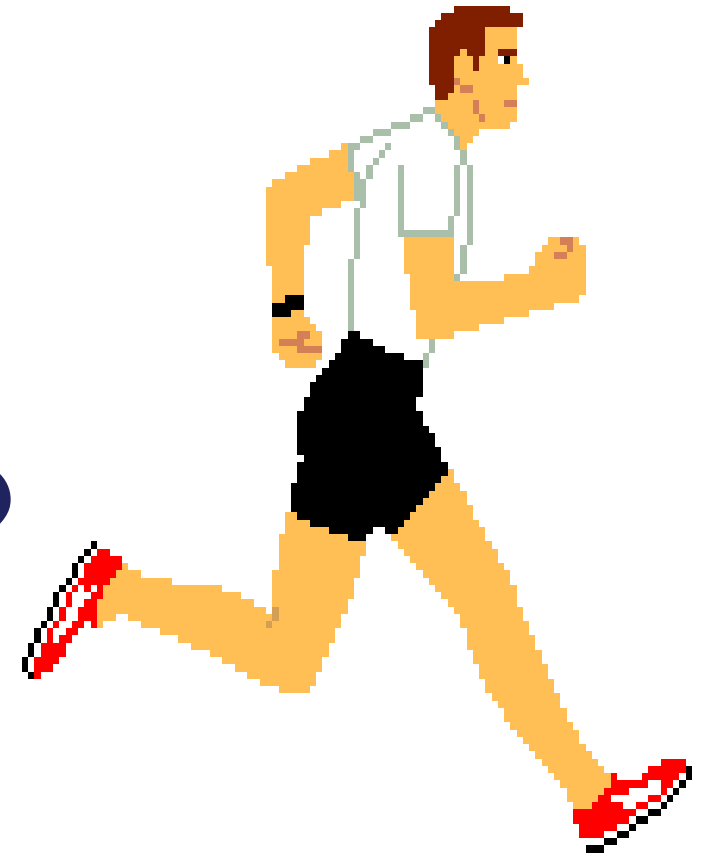
Prolotherapy is an injection therapy for chronic musculoskeletal injury, including knee osteoarthritis.¹⁰⁻¹² A core principle is the injection of small volumes of an irritant solution at multiple painful ligament and tendon insertions and in adjacent joint spaces over several treatment sessions.¹⁰ Prolotherapy has been used in a form recognizable to contemporary prac-

Conflict of interest: authors report none.

CORRESPONDING AUTHOR

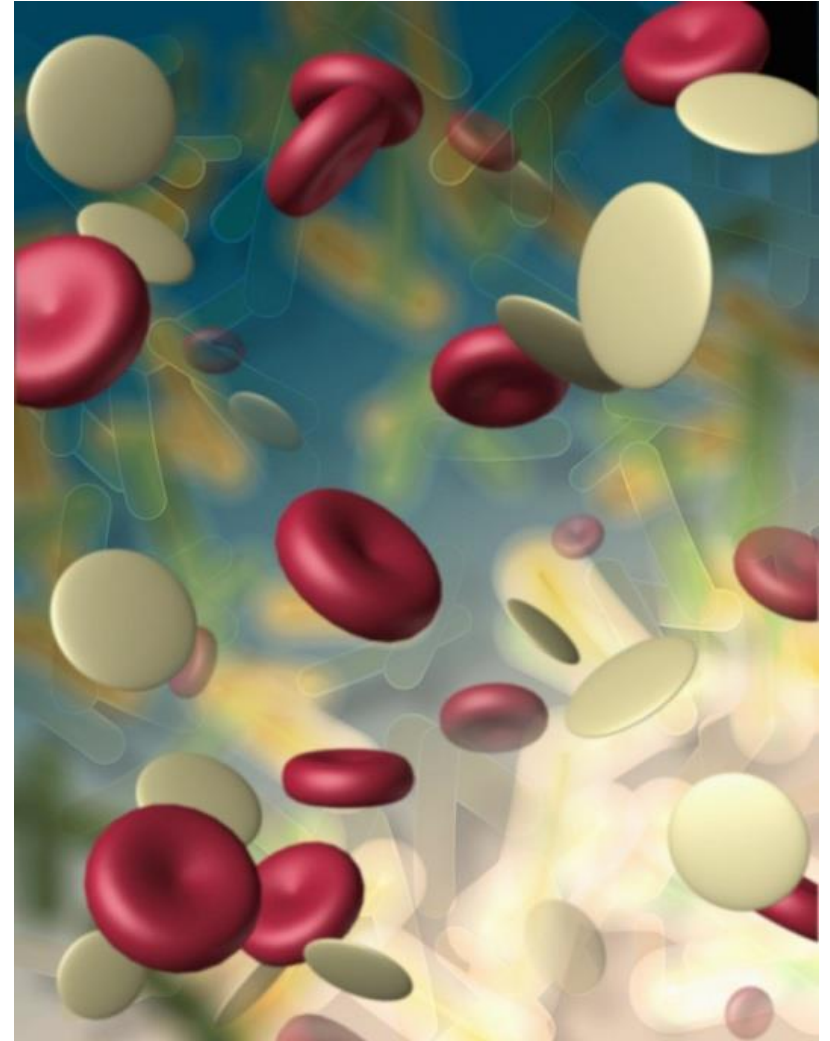
David Rabago, MD
Department of Family Medicine
University of Wisconsin School of Medicine and Public Health
Madison, WI 53715
david.rabago@fammed.wisc.edu

What About Orthobiologics?



What is PRP?

- PRP is defined as a sample of autologous blood with concentrations of platelets above baseline values.
- Clinically active PRP typically contains over 1 million platelets per microliter.
- A part of the medical frontier know as “orthobiologics.”



Marx R. Platelet Rich Plasma: what is it and what is not PRP? Implant Dent 2001;10:225-8.

Platelet Rich Plasma

- Due to the lack of solid evidence for the recommendation of platelet-rich plasma (PRP) injection in patients with knee OA, **we do not recommend its use.**
- Nevertheless, **evidence supporting its efficacy on OA symptoms has been growing rapidly.** Injection of intraarticular PRP resulted in significant improvement in knee pain and function over intraarticular placebo and intraarticular HA up to 12 months post-injection.
- However, **evidence is still limited due to overall high risk of bias** in previous trials and great variability between studies regarding the number of injections, interval between injections, preparation of the PRP, and volume injected.



Who needs to see an Orthopedic Surgeon, and When?



What about just Cleaning up my Knee, Doc?

- **Classic Study:**

- **Mosely JB et al: A controlled trial of arthroscopic surgery for osteoarthritis of the knee. New England Journal of Medicine 2002.**
- 180 pts randomly assigned to:
 - Arthroscopic debridement
 - Arthroscopic lavage
 - Placebo surgery
- No significant benefit vs. placebo during 24 months of follow-up
- Most if not all of the effects of tidal irrigation can be attributed to the placebo effect



Indications for Arthroscopy

- Severe symptomatic OA that has failed to respond to non-surgical management.
- Evidence on clinical assessment of either:
 - Loose bodies
 - Mechanical symptoms: locking, giving way, or catching.



Indications for Total Joint Replacement

- The main indication for total knee arthroplasty is for **relief of pain associated with arthritis of the knee in patients who have failed non-operative treatments.**
 - **American Academy of Orthopedics**



Indications for High Tibial Osteotomy

- **Indications for osteotomy**
 - Age less than 60 years
 - Unicompartamental arthritis
 - 10 to 15 degrees of varus deformity on weightbearing radiographs
 - Preoperative motion arc of at least 90 degrees
 - Flexion contracture less than 15 degrees
 - Ability and motivation to effectively and safely perform rehabilitation



Putting it all Together!



Evidence Based Management Strategy

First-line treatments: full-dose acetaminophen, topical therapies, exercise, tai chi, knee taping, physical therapy



Second-line treatments: nonsteroidal anti-inflammatory drugs



Third-line treatments: tramadol or duloxetine (Cymbalta)



Fourth-line treatments: carefully supervised opiates (50 mg of hydrocodone or 30 mg of oxycodone per day or less), joint replacement in patients with moderate to severe pain and moderate to severe radiographic evidence of osteoarthritis



Ebell MH: Osteoarthritis: Rapid Evidence Review American Family Physician. 2018 Apr 15;97(8):523-526.

SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	Evidence rating	References
Radiography can confirm the diagnosis of OA and may be helpful before surgical referral, but findings tend not to correlate well with symptoms.	C	6, 7
Exercise, physical therapy, knee taping, and tai chi are beneficial for knee OA.	B	14-18
Ineffective treatments for OA include vitamin D and antioxidant supplements, shoes specifically designed for persons with OA, lateral wedge insoles for medial knee OA, physical therapy for hip OA, ionized wrist bracelets, and hyaluronic acid injections.	B	9-13, 19, 21, 50-52
Medical therapy for OA should begin with full-strength acetaminophen and topical therapy, then proceed to nonsteroidal anti-inflammatory drugs and selectively to tramadol and other opioids. Nonsteroidal anti-inflammatory drugs and opioids may reduce pain and improve function, but have significant potential harms.	A	26-36
Joint replacement should be considered for patients with moderate to severe pain and radiographically confirmed OA.	A	40, 41
Corticosteroid injections may be helpful in the short term, but evidence is mixed.	B	47-49

OA = osteoarthritis.

A = consistent, good-quality patient-oriented evidence; **B** = inconsistent or limited-quality patient-oriented evidence; **C** = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to <https://www.aafp.org/afpsort>.

**Ebell MH: Osteoarthritis: Rapid Evidence Review
American Family Physician. 2018 Apr 15;97(8):523-526.**

CLINICAL PRACTICE

Caren G. Solomon, M.D., M.P.H., *Editor*

Osteoarthritis of the Knee

Leena Sharma, M.D.

This Journal feature begins with a case vignette highlighting a common clinical problem. Evidence supporting various strategies is then presented, followed by a review of formal guidelines, when they exist. The article ends with the author's clinical recommendations.

A 60-year-old woman presents with pain in both knees that had started gradually several months earlier. The pain is dull, is not localized to one part of the knee, does not radiate, worsens with some heavy activity, and abates with rest. She reports having no redness, swelling, or morning stiffness, but she has stiffness in the knee after inactivity during the day. She reports that she has not had a knee injury or instances of the knee giving way or locking. She was previously overweight and worries that the pain will make it difficult to maintain a healthy weight and to hike, a favorite activity. Examination reveals no warmth or swelling, mild crepitus, and a normal range of motion. How should the patient be evaluated and treated?

From Northwestern University Feinberg School of Medicine, Chicago. Address reprint requests to Dr. Sharma at Northwestern University Feinberg School of Medicine, Division of Rheumatology, 633 N. St. Clair St., Suite 18-097, Chicago, IL 60611, or at l-sharma@northwestern.edu.

N Engl J Med 2021;384:51-9.
DOI: 10.1056/NEJMcp1903768
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THE CLINICAL PROBLEM

OSTEOARTHRITIS OF THE KNEE IS COMMON, AFFECTING 37% OF PERSONS 60 years of age or older who participated in the National Health and Nutrition Examination Survey (based on radiographic examination),¹ and is more common in women than in men.² The prevalence of osteoarthritis is expected to increase with the aging of the U.S. population.³

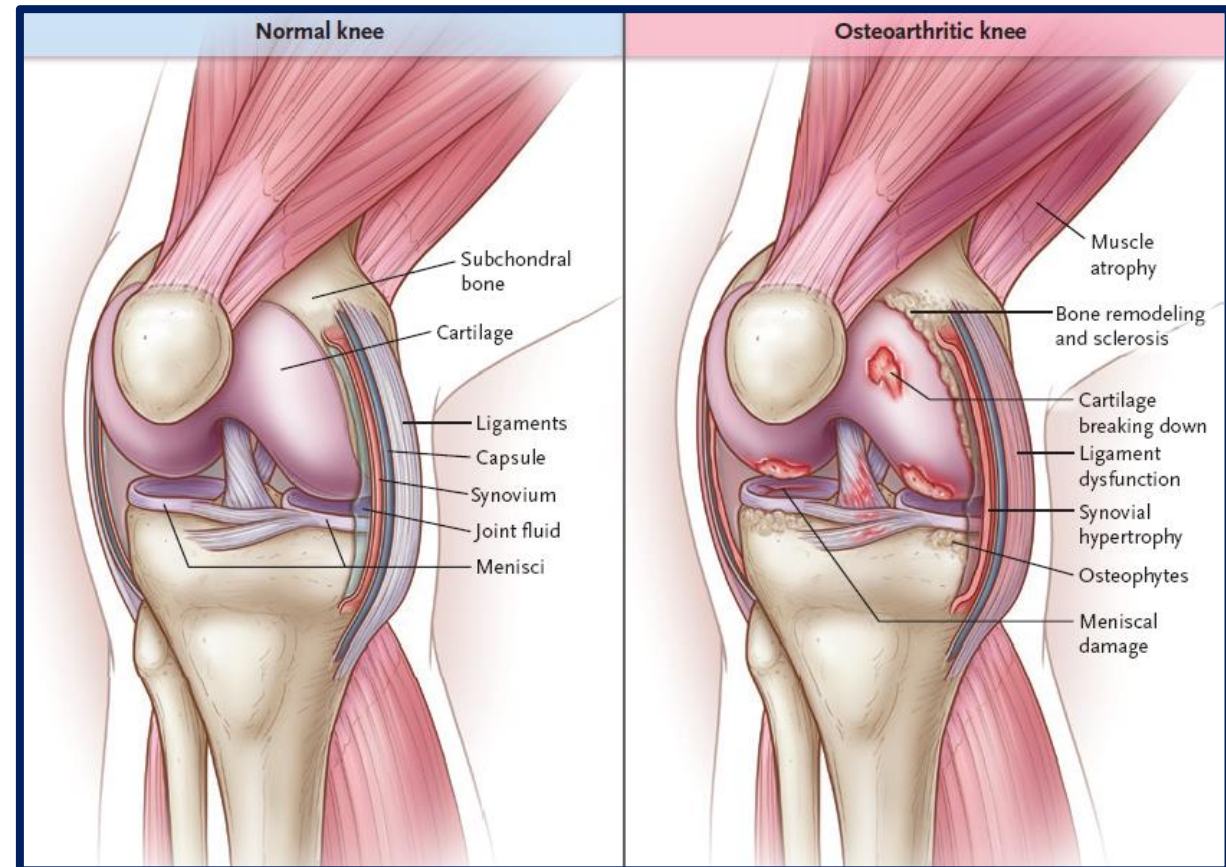
Osteoarthritis represents failed repair of joint damage resulting from stresses initiated by any joint or periarticular tissue abnormality. Although cartilage loss is fundamental, osteoarthritis is a disease of the whole joint (Fig. 1). The rate of progression varies among persons and within a knee over time. The symptoms and signs of knee osteoarthritis include pain, stiffness, reduced joint motion, and muscle weakness. Long-term consequences can include reduced physical activity, deconditioning, impaired sleep, fatigue, depression, and disability. Symptom severity and structural damage on imaging are often discordant. In early osteoarthritis, this discordance may reflect insensitivity of radiography; in persons at high risk for knee osteoarthritis and with normal radiographs, magnetic resonance imaging (MRI) may reveal disease manifestations.^{4,5} As disease advances, the discrepancy may relate to pain sensitization (abnormal responsiveness from changes in nociceptive processing in the peripheral or central nervous system), adaptation to chronic pain, or reduction in activity to avoid pain.

Factors that have been associated with an increased risk of knee osteoarthritis include older age, female sex, overweight or obesity, knee injury, occupational factors (e.g., knee bending, heavy lifting, and squatting), and varus or valgus alignment. Risk is not increased with recreational physical activity.^{6,7}

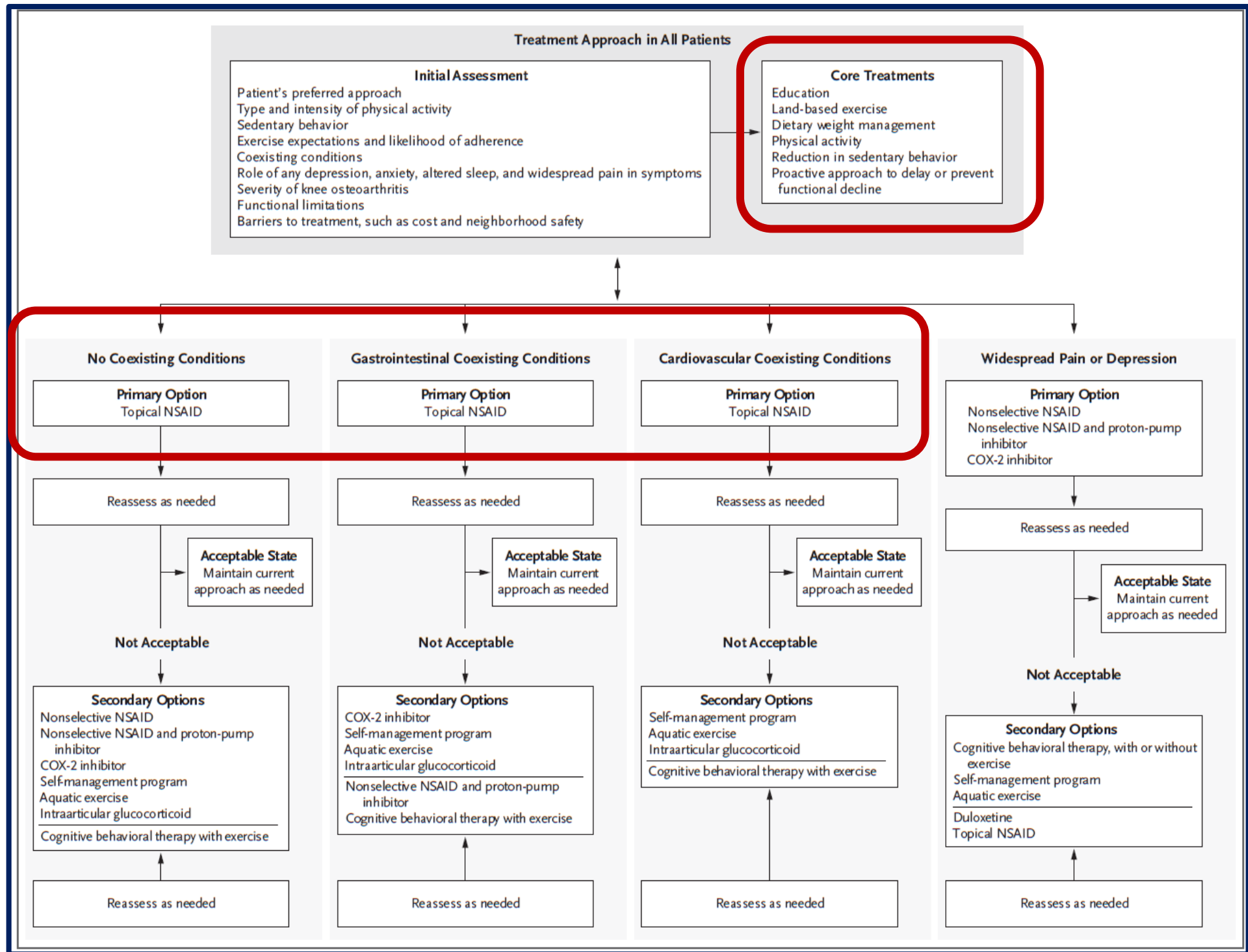
Pain from osteoarthritis of the knee is difficult to study longitudinally because it fluctuates and its pattern evolves. Episodic pain is predictable in early stages but becomes less predictable and more distressing in late stages.⁸ Factors that have



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**Sharma L. Osteoarthritis of the Knee. N Engl J Med. 2021
Jan 7;384(1):51-59.**



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Summary for Managing Osteoarthritis

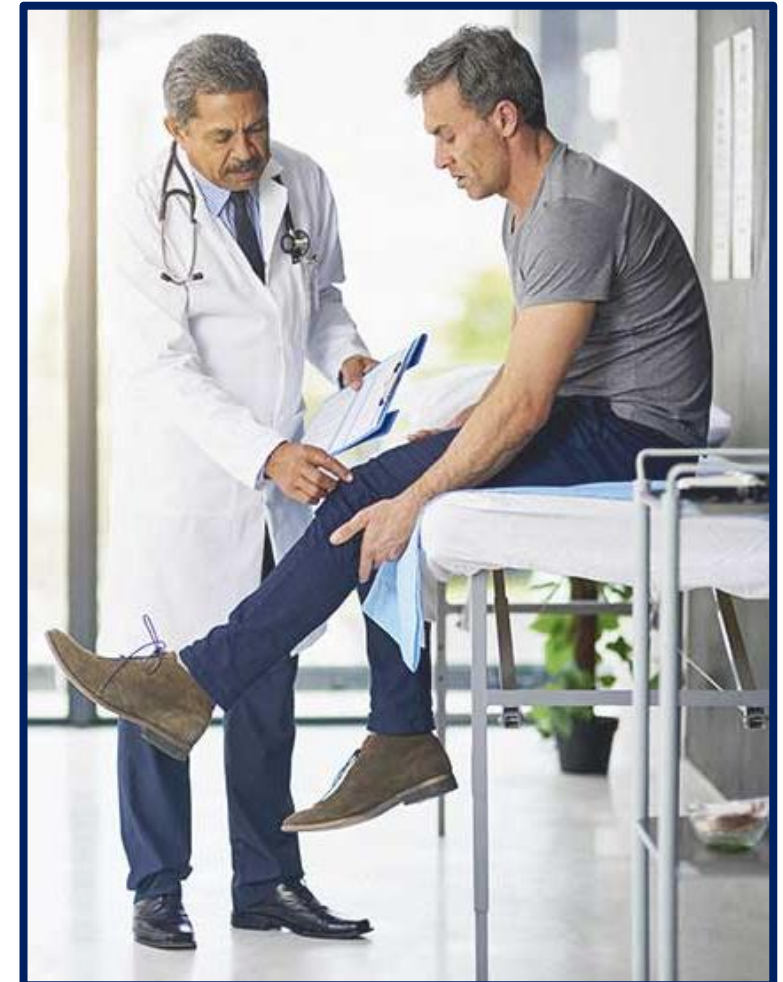
- Do a good History and Physical Examination.
- Individualize the Patient.
- Non-pharmacologic therapy is the hallmark of treatment for Osteoarthritis.
- Exercise is always good...it's the type that needs to be carefully determined.
- Pharmacologic therapy is adjunctive.
- Surgery is when all else has failed.



A New Paradigm for Musculoskeletal Pain Management

Box 1: Key principles underpinning the perceived benefits of the proposed model (ACES).

- Aiming to build the self-efficacy to take control and ultimately be responsible and self-manage their health
- Coaching individuals to engage in exercise and a healthy lifestyle (physical activity, sleep, smoking cessation, appropriate nutrition choices, weight and stress management, importance of social interaction, *etc.*)
- Education regarding the biopsychosocial contributors to the musculoskeletal conditions
- Strong clinical alliance



Lewis JS, Stokes EK, Gojanovic B, Gellatly P, Mbada C, Sharma S, Diener I, O'Sullivan P. Reframing how we care for people with persistent non-traumatic musculoskeletal pain. Suggestions for the rehabilitation community. Physiotherapy. 2021 Apr 20;112:143-149.

For Further Information

Please contact:

francis.oconnor@usuhs.edu

