Osteoarthritis and the Athletic Trainer: A Public Health and Chronic Disease Management Approach

Kenneth L. Cameron, PhD, MPH, ATC
Director of Orthopaedic Research
John A. Feagin Jr. Sports Medicine Fellowship
Keller Army Hospital
United States Military Academy
West Point, New York

Disclosure

The views and opinions expressed are those of the presenter and do not reflect the official policy of the Department of the Army, the Department of Defense, or the U.S. Government.

Overview

• What is osteoarthritis (OA) and what is the impact of OA?
• What are the risk factors for OA?
• Why should athletic trainers (ATs) care about OA?
• Review the chronic disease management model for OA.
• Discuss potential roles ATs might have in the prevention and management of OA.
• Review EBP Recommendations for OA Management and the CDC Public Health Agenda for OA.

What is Osteoarthritis?

Osteoarthritis (OA) is caused by a combination of genetic, local mechanical stresses, and/or systemic factors that lead to joint cartilage loss, bony overgrowth and other bone changes, and alterations in ligaments, menisci and muscles.
Arthritis is the leading cause of disability in the U.S.

OA is the most common form of arthritis and over 27 million Americans are affected by this chronic condition.

An estimated 632,000 joint replacements due to OA are performed annually costing $30 billion.

OA results in over 11 million outpatient visits annually.

Estimated that OA results in over $13 billion in lost productivity annually.

The Impact of OA

What are the Risk Factors?

Non Modifiable Risk Factors
- Sex
- Age
- Genetics
- Bone Shape

Modifiable Risk Factors
- Obesity / Diet
- Joint Trauma
- Malalignment
- Bone Density
- Occupation
- Muscle Strength

OA Only Affects Old People

OA prevalence starts rising sharply at age 45, affecting the large working age population.

Early onset OA can develop within ten years of a major joint injury (PTOA).

A teenager injured at age 15 could have PTOA as early as age 25 or 30. (Roos. Osteoarthritis Cartilage. 1995)

What is PTOA?

Post-traumatic osteoarthritis (PTOA) is a unique form of OA that is associated with acute traumatic joint injury.

The disease is likely to follow a shorter time course because of the more rapid progression in disease observed following injury.

PTOA typically affects people at a much younger age.
The Impact of PTOA

- Estimated 12% of OA due to post-traumatic onset (Brown et al., J Ortho Trauma, 2012)
- Lower extremity PTOA costs ~$3 billion/year in direct health care expenses.
- Indirect costs and disability adjusted life years are significantly higher.
- Increased risk for early primary and revision total joint replacement surgery.

OA and the AT

Why should athletic trainers be concerned about OA?

Link et al., 2003

Joint Injuries and OA

Acute Traumatic Joint Injuries are a Common Problem

PTOA IS A COMMON OUTCOME

Joint Injuries and OA

- Nearly 33% of shoulders examined with CT prior to initial shoulder stabilization had signs of OA, with the number of prior instability events being associated with degenerative changes. (Ogawa et al., J Shoulder Elbow Surg; 2006;15(1):23-29)
- Individuals in The Clearwater Osteoarthritis Study were 7.4 (95% CI: 5.9, 9.4) times more likely to develop OA during follow-up. (Wilder et al., Osteoarthritis Cartilage, 2002;10:611-16)
- Among female soccer players, 82% had radiographic changes in the knee 12 years following ACL injury and 51% had OA by age 31. (Lohmander et al., Arthritis Rheum. 2004;50(10):3146-52)
Joint Injuries and OA

- OA at 10-12 years after an injury
- 16% w/ ACL reconstruction w/ no meniscectomy
- 50% w/ ACL reconstruction w/ meniscectomy

Joint Injuries and OA

PRIMARY PREVENTION IS CRITICAL

Sports and OA Risk

- Most sports are safe or even protective for OA. (Urquhart DM et al., Med Sci Sports Exerc. 2011)


<table>
<thead>
<tr>
<th>Former athletes with more knee OA</th>
<th>Increase in odds of having knee OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elite male competitive weightlifting</td>
<td>6.9 (3.3, 14.5)</td>
</tr>
<tr>
<td>Elite male wrestling</td>
<td>3.8 (1.8, 8.0)</td>
</tr>
<tr>
<td>Elite and non-elite male soccer</td>
<td>3.5 (2.5, 4.8)</td>
</tr>
<tr>
<td>Elite male long-distance running</td>
<td>3.3 (1.4, 7.5)</td>
</tr>
</tbody>
</table>

Sports and OA Risk

- High level long-distance skiers are at high risk for knee and hip OA. (Michaelsson et al. PLOSOne. 2011)

Is it the sport, the amount of training, high volume repetitive loading, injuries, or a combination of factors?

- There is a lack of data among female athletes.
- There is a lack of data among former college and HS athletes.
Habitual running is not related to OA later in life (Lo et al, 2014) 

Habitual running while having OA is not related to worsening symptoms or disease (Lo et al, 2015) 

Physical activities with high volume repetitive loading may increase the risk of OA, specifically in the presence of other risk factors. 

There is a lack of data on military service members.
Osteoarthritis

Why do we see significantly higher incidence rates for OA in military service members?

- Acute traumatic joint injuries are endemic within military populations and these injuries likely lead to PTOA.
- The physical training and occupational demands placed upon military service members require a significant amount of repetitive bending, squatting, kneeling, and lifting.
- While military service members are required to meet minimum height and weight standards, a modern combat load can range from 52 pounds to well over 100 pounds.

Managing Chronic Disease

The Chronic Disease Management Model for CVD

- Cholesterol
- BP
- Obesity
- Smoking

Risk Factors

Follow up

- Annual Visit
- Early Interventions

Opportunity for Early Intervention

End Stage Disease

- Heart Attack
- Stroke

Managing Chronic Disease

The Chronic Disease Management Model for PTOA

Risk Factors

Surgery

Rehab 6-9 Months

End Stage Disease

End Stage Disease

Come back and see me when you need your knee replacement

Traditional Management Model

- Traditionally, the management of acute traumatic joint injuries has terminated when patients are deemed fit to return to activity.
- Treatment has focused on restoring anatomic structures and initial functional capabilities through surgical repair, and patients without complications are typically discharged from follow-up care at 6-9 months post-surgery.
- However, these injuries are the starting point for a cascade of progressive degenerative joint changes that, over the course of several years, lead to chronic pain and loss of function, resulting in physical limitations that affect both physical performance and activities of daily living.
The Clinical Course of PTOA

<table>
<thead>
<tr>
<th>OA STAGE</th>
<th>MOLECULAR</th>
<th>PRERADIOGRAPHIC</th>
<th>RADIOGRAPHIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRECURSORS</td>
<td>BONE SCAN</td>
<td>MRI</td>
<td>X-RAYS</td>
</tr>
</tbody>
</table>

**DISEASE INITIATION & JOINT INJURY (SILENT)


---

**A Call to Action from the Chronic Osteoarthritis Management Initiative (COAMI)

September 2012

Missed Opportunities to Detect and Treat Osteoarthritis (OA)

Not every case of Osteoarthritis (OA) can be prevented, but the Chronic OA Management Initiative (COAMI) believes that a significant degree of the pain and disability caused by OA can and should be prevented or ameliorated.

http://www.usbj.org/sites/default/files/COAMI%20Call%20to%20Action.pdf

---

**Managing Chronic Disease

The Chronic Disease Management Model for PTOA

Athletic Trainer as Case Manager/Gatekeeper

Risk Factors

- ACL Injury
- Meniscus Injury

Follow-up

- Annual Visit
- Monitor Joint Health
- Monitor Weight

End Stage Disease

- Radiographic OA
- TKA

Opportunity for Early Intervention


- Education & Self-Management
- Low Impact Aerobic Exercise
- Weight Management
Using a Telehealth Platform to Deliver Innovative Therapeutic Care for Military Service Members at High Risk for Post-traumatic Osteoarthritis

FY15 AMEDD Advanced Medical Technology Initiative (AAMTI) Project

MHCE/mCare Is:

- Integrated system with a mobile application component
- Bi-directional synchronization of patients and providers/care team members over distance (synchronous and asynchronous)
- Secure, HIPAA compliant mobile messaging with FIPS-140-2 certified encryption
- Leverages a Bring Your Own Device (BYOD) model
- Mobile Device "Neutral" [Android, BlackBerry, iOS, JAVA, Windows Mobile, etc.]
- A Defense Business Certification (DBC) credentialed system
- Longitudinal database captures trends and potential for cause – analysis
- Escalation triggers automatic alerts to care team
- Awarded one of the Army’s Greatest Inventions for 2010

Background:
Mobile Health Care Environment (MHCE) System/ mCare App

Information flow:
1. Care team enters and schedules a message
2. Message is sent to the soldier's phone
3. Service member responds to the message
4. Care team views responses and reports status

Data encrypted at rest and in transit
Supports run time and all major OS environments
500,000+ bi-directional transactions to date reviewed under research protocols

Evidence-Based Practice

A systematic review of recommendations and guidelines for the management of osteoarthritis: The Chronic Osteoarthritis Management Initiative of the U.S. Bone and Joint Initiative

Amanda E. Neelon, MD, MSCR, J.D., Kelli D. Allen, PhD, Yvonne M. Golightly, PT, PhD, Adam P. Goode, OMT, PMDC, Joanne M. Jordan, MD, MPH

Seminars in Arthritis and Rheumatism

A systematic review of recommendations and guidelines for the management of osteoarthritis: The Chronic Osteoarthritis Management Initiative of the U.S. Bone and Joint Initiative

Amanda E. Neelon, MD, MSCR, J.D., Kelli D. Allen, PhD, Yvonne M. Golightly, PT, PhD, Adam P. Goode, OMT, PMDC, Joanne M. Jordan, MD, MPH

1. Department of Medicine, University of North Carolina, Chapel Hill, NC
2. Department of Medicine, Mayo Clinic, Rochester, MN
3. Department of Medicine, Oregon Health & Science University, Portland, OR
4. Department of Medicine, University of Wisconsin, Madison, WI
5. Department of Orthopaedics, University of North Carolina, Chapel Hill, NC
6. Department of Medicine, University of Bath, Bath, UK
7. Department of Medicine, University of California, Los Angeles, CA
8. Department of Medicine, University of California, San Francisco, CA
9. Department of Medicine, University of North Carolina, Chapel Hill, NC
10. Department of Medicine, University of California, San Francisco, CA

Contents lists available at ScienceDirect
Seminars in Arthritis and Rheumatism
“Provide or refer patients to self-management programs; provide education, regular contact to promote self-care, joint protection strategies, and individualized treatment plans to patients with OA.”


“Patients should be advised to engage in low-impact aerobic exercise (land or water based), and if overweight to lose weight; consideration can be given to range of motion/flexibility exercises, exercise in combination with manual therapy, endurance strengthening exercises, and physical/occupational therapy referral.”


“Walking aids and other assistive devices to improve activities of daily living are recommended for OA patients as needed. Based on current guidelines, there is inconclusive evidence for bracing or medial or lateral heel wedges for knee OA, and splints for thumb base OA.”


“Thermal modalities are recommended for hand, knee, and hip OA, therapeutic ultrasound is not recommended for use, and insufficient evidence currently exists to provide a general recommendation regarding acupuncture, Tai Chi, or TENS.”

“Joint replacement is recommended for appropriate patients with knee or hip OA. Arthroscopy with debridement is not recommended for the management of symptomatic knee OA.”


“Acetaminophen/paracetamol should be used as first-line therapy in symptomatic OA. Second-line agents should include topical agents (capsaicin and topical NSAIDs) and oral NSAIDs (with appropriate risk stratification and employment of gastroprotective strategies). For refractory symptoms, tramadol is recommended, and consideration can be given to opioids or possibly duloxetine.”


“Intra-articular corticosteroids are recommended for knee and hip OA; insufficient evidence currently exists to provide a general recommendation regarding intra-articular hyaluronans.”


“There is essential agreement on many recommendations for OA management across multiple societies making such recommendations. There is not a lack of quality guidelines, but rather a deficit in dissemination and implementation of the recommendations.”

Athletic Trainers can play a critical role in the implementation of public health interventions for OA.

1. Self-management education should be expanded as a community-based intervention for people with symptomatic OA.
2. Low-impact, moderate-intensity aerobic physical activity and muscle strengthening exercises should be promoted widely as a public health intervention for adults with OA of the hip and knee.
3. Existing policies and interventions that have been shown to reduce OA-related joint injury should be implemented and expanded.
4. Weight management should be prioritized for the prevention and treatment of OA, and national nutrition and dietary guidelines for the general population should be universally applied to OA so they reflect a healthy diet and physical activity.
5. A national policy platform for OA should be established to improve the nation’s health through evidence-based clinical and community prevention and disease control activities, including core public health infrastructure improvement activities.
6. Systems to deliver evidence-based interventions should be expanded.
7. Quality and fluid access to evidence-based interventions for OA should be assured.

Low impact, moderate intensity aerobic physical activity and muscle strengthening exercises should be promoted widely as a public health intervention for adults with OA of the hip and knee.
• Primary prevention
  • Movement assessment
  • ACL and lower-extremity injury prevention
  • Weight management/Exercise prescription
  • Advocacy
• Secondary prevention (Following traumatic joint injury)
  • AT as case manager/gatekeeper
  • Monitor joint health over time
  • Education/Self-management
  • Weight management/Exercise prescription
  • Therapeutic modalities
  • Monitor compliance

ATOAC Recommendations
• Educate athletic trainers and athletic training students through entry-level education and continuing education programs about OA and the common risk factors for this debilitating disease that are seen in young athletic and physically active populations commonly treated by athletic trainers.

• Athletic trainers should support and implement evidence-based primary injury prevention interventions to reduce the risk of acute traumatic joint injuries, which will in turn reduce the risk of OA.

• Athletic trainers should counsel patients with joint injuries about their risk of OA and strategies to regularly monitor changes in joint health over time.

• Athletic trainers should counsel patients with joint injuries about common modifiable risk factors for OA and self-management strategies that may mitigate OA risk or progression.

• Athletic trainers should be knowledgeable of and apply existing guidelines and recommendations for managing OA in high risk patients following joint injury (e.g., Nelson et al).
ATOAC Recommendations

• Athletic trainers should support the top 10 recommendations outlined in the CDC National Public Health Agenda for OA.

• Athletic trainers should support the Chronic Osteoarthritis Management Initiative (COAMI) and recommendations to treat individuals with a history of joint injury as a high risk patient population for subsequent OA.

Strategic Partnerships

Summary

• OA places a significant burden on the U.S. population.

• 12% of all OA cases are attributable to traumatic joint injury.

• Innovative chronic management models for OA (e.g., COAMI) are beginning to emerge and ATs have the potential to play a critical role in developing and implementing these models and systems of care.

• There is no lack of consensus on management strategies for OA across professional organizations; however, these guidelines are not consistently disseminated or implemented clinically.

• ATs can play a significant role implementing and advancing the 2010 National Public Health Agenda for OA.
GO BEAVERS!!

Questions