Research Priorities for the Unified Orthopaedic Research Agenda

The mission of the Unified Orthopaedic Research Agenda is to advance science and research in orthopaedic care through a unified research strategy. Continued and additional funding of these research priorities is necessary to improve function and mobility and reduce the socioeconomic burden of musculoskeletal disorders.

Musculoskeletal diseases are the most common health condition in the United States.

Musculoskeletal disorders and diseases are the leading cause of disability in the United States and account for more than half of all chronic conditions in people over 50 years of age in developed countries. The economic impact of these conditions is staggering. In the United States, the direct expenditures in health care costs and the indirect expenditures in lost wages is estimated to be $874 billion annually, or 5.7% of the national gross domestic product. The average annual cost per person for treatment is $7,800. The aging boomer generation (persons born between 1946 and 1964), accounts for an increasingly greater proportion of total musculoskeletal disease treatment cost and lost wages, a trend that will continue for the next several decades. One in two adults reported a chronic musculoskeletal condition in 2011, nearly twice the rate of reported chronic cardiac or respiratory conditions. **Orthopaedic surgery** is a medical specialty that preserves and restores the structure and function of bones, joints, muscles, and other associated structures through medical, surgical, and rehabilitation techniques.

Priorities Relevant to All Orthopaedic Research

- **Improving outcomes of orthopaedic care, both surgical and nonsurgical**
- **Patient safety and healthcare quality**
- **Creating value through orthopaedic care**
- **Promoting equal access to musculoskeletal care for all people regardless of age, race, socioeconomic status, sex (biological), or gender (societal) and eliminate disparities in outcomes.**

Orthopaedic Conditions with the Greatest Burden of Disease

- **Arthritis and cartilage injuries**
- **Spinal disorders, neck and back pain**
- **Muscle, tendon, ligament, and nerve injuries**
- **Osteoporosis and bone fragility, especially fractures in the elderly and those caused by cancer**
- **Major limb trauma/high-energy extremity injuries**
- **Childhood musculoskeletal conditions**

Priorities for Strengthening Orthopaedic Research

- **Train and increase diversity of the next generation of orthopaedic clinician investigators and basic scientists**
- **Support for interdisciplinary teams of orthopaedic scientists**
- **Support for scientific infrastructure**

Patient Safety and Healthcare Quality

Orthopaedic surgeons support minimizing - with a goal of eliminating - all types of preventable surgical harms.

Creating Value Through Orthopaedic Care

In healthcare terms, value is defined as achieving the greatest improvement in health for every dollar that is spent. Specific research will address the most common and most debilitating orthopaedic ailments to society: Arthritis and Cartilage Injuries; Spinal Disorders, Neck and Back Pain; Muscle, Tendon, Ligament, and Nerve Injuries; Osteoporosis and Bone Fragility, especially fractures in the elderly and those caused by cancer; Major Limb Trauma/High-Energy Extremity Injuries; and Childhood Musculoskeletal Conditions. By studying how orthopaedic treatment can provide relief for these conditions, orthopaedic research will lead to improved overall health, and thereby creating greater value to society through a stronger work force, an increase in productivity, and an enhanced quality of life.

AAOS American Academy of Orthopaedic Surgeons / American Association of Orthopaedic Surgeons | OREF Orthopaedic Research and Education Foundation | ORS Orthopaedic Research Society | Bone and Joint Initiative USA

Arthritis and Cartilage Injuries *(Average Annual Health Care Cost: $116.1 Billion)*

- Arthritis is the most common cause of adult disability and is among the leading conditions causing work limitations
  - Genetic, sex-related, mechanical, environmental, and biologic factors that cause arthritis need to be identified
  - Diagnostic tools that detect, predict, and track arthritis progression need to be developed
- In 2012, 52.5 million adults reported they have arthritis. By 2030, the number of persons with doctor-diagnosed arthritis is projected to increase to nearly 67 million, or 25% of the adult population
  - Strategies to prevent or delay arthritis and therapies to stop the development of arthritis following joint injury need to be developed and implemented

Spinal Disorders, Neck and Back Pain *(Average Annual Health Care Cost: $253 Billion)*

- Lumbar / low back pain and cervical / neck pain are among the most common physical conditions requiring medical care and affecting an individual's ability to work and manage the daily activities of life
  - Diagnosis of spinal disorders, including the ability to localize the source of pain, evaluate motion segment instability, and evaluate the role of muscles and connective tissues on back pain, need to be improved
- There are over 52 million healthcare visits annually for back pain. 1 in 4 adults (58.8 million) suffer from chronic low back pain.
  - The etiology of spinal pain and the role of medical, complementary, and surgical treatment needs to be studied

Muscle, Tendon, Ligament, and Nerve Injury

- Soft tissue injuries and conditions account for 2 million hospitalizations, 9 million bed days, 6.5 million outpatient visits, 18 million emergency room visits, 64 million physician's office visits, and over $28 billion in costs annually
  - Biological or biomedical engineering approaches to restore muscle function and mobility must be studied
- Soft tissues, including ligaments, tendons, muscles and nerves, are vulnerable to damage from occupational accidents, sports and recreational injury, repeated overuse, and even normal everyday activities in susceptible individuals
  - Biological replacements for muscle, nerve, ligament, tendon, meniscus, and cartilage must be developed
- 9.5 million sports injuries per year in the U.S. involve soft tissues
  - Pathomechanics of soft tissue injury, focusing on prevention and the development of more effective protective strategies for particular sports and jobs where risks of physical impairment exist, must be studied

Osteoporosis and Bone Fragility, especially fractures in the elderly and those caused by cancer

- Nearly 54 million Americans suffer from osteoporosis, a disease characterized by low bone mass and deterioration of bone structure that causes bone fragility and increases the risk of fracture. 1 in 2 women and 1 in 4 men over age 50 will have an osteoporosis-related fracture, with 20% mortality rate within 12 months of a hip fracture. Osteoporosis causes 2 million broken bones annually and costs over $19 billion in related costs.
  - Public education campaigns for the maintenance of bone mass throughout the lifespan need to be implemented
  - Techniques to improve bone quality and strength must be advanced
  - Differences between male and female fracture presentation, morbidity, and mortality need to be further investigated
- Primary and metastatic bone cancer is a major source of morbidity and mortality for patients
  - Improved pathologic fracture/prospective fracture care for cancer patients must be provided

Major Limb Trauma / High-Energy Extremity Injuries

- 77% (65.8 million) of all injury health care visits are for musculoskeletal injuries
  - Biologic treatments to accelerate the normal fracture healing process, including the use of growth factors and cell therapies, need to be developed
- Fractures represent over 25% of self-reported musculoskeletal injuries; over 18.3 million fractures are treated annually
  - Improve techniques for the diagnosis and treatment of fractures that do not heal as expected (nonunions), including the use of growth factors and cell therapies
- Nearly 2 million people live with limb loss in the United States (all causes)
  - Guidelines for the care of amputees, including surgical techniques, pain control, rehabilitation and artificial limb development, must be established
  - Rehabilitation methods to enhance return to work and regular activities after major limb trauma must be refined

Childhood Musculoskeletal Conditions

- Approximately half of children will sustain a fracture
  - High quality research studies need to be conducted regarding the surgical and nonsurgical management of pediatric trauma, including the development of injury prevention programs
- Poor nutrition and lack of exercise can cause low bone mineral density in childhood
  - Develop bone health programs directed toward children and adolescents to optimize peak bone mass
- Childhood obesity can have consequential effects on the bones and joints
  - Effects on the musculoskeletal system such as fracture risk, osteoarthritis, and bone density, need to be further studied
- Disorders of the growing skeleton can result in deformity, scoliosis, leg length abnormalities, or arthritis
  - Developmental biology of the musculoskeletal system in the child with an emphasis on bone and joint development needs to be examined, and orthopaedic devices appropriate for children and adolescents need to be designed

Burden of Disease data obtained from The Burden of Musculoskeletal Diseases in the United States, © 2015. www.boneandjointburden.org

For more information, contact the
American Academy of Orthopaedic Surgeons
www.aaos.org/research / researchinfo@aaos.org
Updated September 2015

Contributing Societies: American Association for Hand Surgery (AAHS); American Association of Hip and Knee Surgeons (AAHKS); American Orthopaedic Foot and Ankle Society (AOFAS),American Orthopaedic Society for Sports Medicine (AOSSM); American Shoulder and Elbow Surgeons (ASES), Cervical Spine Research Society (CSRS); The Hip Society; J. Robert Gladden Orthopaedic Society (JRGOS); Limb Lengthening and Reconstruction Society (LLRS); Musculoskeletal Tumor Society (MSTS); North American Spine Society (NASS); Orthopaedic Rehabilitation Association (ORA); Orthopaedic Research Society (ORS); Orthopaedic Trauma Association (OTA); Pediatric Orthopaedic Society of North America (POSNA); Ruth Jackson Orthopaedic Society (RJOS); and Scoliosis Research Society (SRS).