

# 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 orthopaedic disorders.*

## Priorities Relevant to All Orthopaedic Research

- Patient safety
- Creating value through orthopaedic care
  - Comparative effectiveness of orthopaedic care
  - Dissemination of the results of orthopaedic research in a way that rapidly impacts clinical care
- Use of biologics (cells, growth factors) to improve musculoskeletal outcomes
- Obesity epidemic and its impact on musculoskeletal care
- Eliminating disparities in access to and the outcomes of musculoskeletal care

## 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 the Orthopaedic Research Community

- 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

## Health Services Research Priorities

- Improve patient safety in the care of orthopaedic disorders
- Develop tools to measure orthopaedic outcomes
- Study comparative effectiveness in orthopaedic disorders
- Quantify the burden of disease for orthopaedic disorders
- Research new models of dissemination and implementation of results, to more rapidly impact patient care

## Clinical Research Priorities

- Conduct clinical trials of biologic treatments (cells and growth factors) to enhance recovery after injury
- Expand and explore opportunities in musculoskeletal transplantation

## Basic and Translational Research Priorities

- Identify cellular processes that facilitate repair and regeneration of musculoskeletal tissue
- Investigate molecular mechanisms controlling growth and differentiation of cells of the musculoskeletal system
- Study the effect of metabolism on basic cellular processes involved in cells of musculoskeletal origin
- Identify cellular markers of musculoskeletal stem cells
- Explore regulation, expression, and role of musculoskeletal cytokines
- Improve animal models for tissue engineering research
- Investigate the role of mechanical forces and other physical cues in musculoskeletal health and disease

## Patient Safety and Healthcare Quality

- Develop definitions for healthcare quality within orthopaedic surgery and establish methodology to obtain measurable outcomes
- Develop strategies to maximize patient safety, minimizing complications and preventable adverse events
- Study the short- and long-term implications of current quality initiatives on healthcare quality, costs, patient access, and hospital behavior
- Perform high-quality studies regarding treatment indications for common orthopaedic conditions, including operative versus non-operative management or various types of surgical management. Determine impact of underlying patient demographics and morbidities
- Quantify the impact of orthopaedic care on the individual and society
- Develop evidenced-based programs to help musculoskeletal patients and providers navigate the changing face of health care as mandated by the Affordable Care Act

## Creating Value Through Orthopaedic Care

### **VALUE = (Outcomes + Safety + Satisfaction) / Cost**

In healthcare terms, value is defined as achieving the greatest improvement in health for every dollar that is spent. Dedicated research in orthopaedics is focused on attaining the best health possible at the lowest possible cost. Because improving health depends on how well the health status of our society is measured, ongoing orthopaedic research will spend a sizable portion of its efforts on appraising, defining, and then re-defining what quality means to our patients and to society. By studying how orthopaedic treatment can provide relief for these conditions, orthopaedic research will lead to improved overall health, and thereby, create greater value to society by contributing to a stronger work force, an increase in productivity, and an enhanced quality of life.

**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
- ✚ Childhood Musculoskeletal Conditions

## Arthritis and Cartilage Injuries

- Identify criteria to predict whether a surgical and non-surgical approach will be effective for a given arthritis patient
- Develop and implement validated exercise strategies to prevent or delay arthritis
- Discover new mechanisms to prevent arthritis following joint injury with the goal of developing early therapeutic interventions
- Improve diagnostic tools and their ability detect, predict, and track arthritis progression
- Develop new therapies to advance the regeneration of cartilage damaged by arthritis, including methods that mobilize endogenous stem cells and those that deliver cells, biologics, or biomaterials to facilitate repair.
- Identify the genetic, mechanical, and biological factors that cause arthritis and how they interact at the molecular, cellular, and tissue levels.
- Discover mechanisms of crosstalk among cartilage, subchondral bone, and other tissues in the healthy joint and the mechanisms by which this cooperation is lost in arthritis

## Spinal Disorders, Neck and Back Pain

- Improve the ability to diagnose 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
  - Develop new clinical, electrophysiological, imaging, and psychometric tools for the diagnosis of various causes of back pain and instability
  - Develop objective and scientific methods of assessing structural and functional status of paravertebral muscles and ligaments of the vertebral columns
- Develop and compare new treatment methods for degenerative disc disease and deformity with respect to clinical outcomes, complications, and value
  - Identify scientific rationale and evidence for new treatment methods
  - Determine clinical efficacy and patient-reported outcomes of various treatment methods
  - Reduce complications of various treatment methods, including postoperative infection, junctional deformity, spinal cord and nerve root dysfunction
- Study the etiology of spinal pain and the role of medical, surgical, and complementary treatments
  - Elucidate the pathophysiology of back pain
  - Identify effective pain control methods in patients with neck or back pain
  - Develop a collaborative, evidence-based clinical practice guideline for the treatment of spinal disorders and injuries, addressing issues of patient safety, quality care and value for infection, spinal cord monitoring, optimal fusion levels to prevent postoperative junctional deformity

## Muscle, Tendon, Ligament, and Nerve Injuries

- Increase the understanding of the causes of peripheral nerve disorders and develop enhanced diagnostic methods to facilitate alternatives to surgical treatment
- Expand the role of prefabricated engineered tissue in free tissue transfer and transplantation
- Develop biological replacements for muscle, nerve, ligament, tendon, meniscus, and cartilage using tissue engineering techniques and/or gene therapy
- Study the 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
- Study the pathophysiology of muscle atrophy and diseases and develop biological or biomedical engineering approaches to restore muscle function and mobility

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

- Expand the emphasis on the current and forthcoming treatments for low bone mass and strength, focusing on increasing bone mass and strength while decreasing fracture risk
- Delineate the mechanism(s) responsible for the attainment and maintenance of peak bone mass in both sexes and all races, focusing on improving the assessment, treatment and prevention of low bone mass, and increased fracture risk
- Study pathophysiology and develop new therapeutic strategies for primary and metastatic bone cancers and the impact on bone strength, patient survival and QOL
- Focus studies on better imaging modalities and cellular / molecular approaches to increase bone mass and strength
- Improve educational opportunities for patients to ensure safe continuation of daily activities, focusing on fall prevention, education and awareness of secondary prevention measures
- Coordinate partnerships with other specialties to provide multidisciplinary care for patients with low bone mass with significant comorbidities including diabetes, obesity, substance abuse, and smoking

## Major Limb Trauma / High-Energy Extremity Injuries

- Develop evidence-based clinical practice guidelines for multidisciplinary care of amputees including surgical and post-surgical limb preparation as well as prosthetic development and management, focusing on surgical techniques including bone bridge transtibial amputation, wound closure, phantom pain management, and post amputation rehabilitation and prosthetic management
- Expand emphasis on the biologic treatment and manipulation of the fracture healing cascade, focusing on biologic agents and delivery systems to accelerate normal fracture healing
- Define the chronological and dose responses for cell-mediated therapies
- Refine diagnostic modalities, elucidate etiologies, and further develop mechanical and biological treatment strategies for fracture nonunions, focusing on biological diagnosis of nonunion and further development of biologic mediators and cell-based stimuli to improve healing of bone defects and nonunions
- Improve rehabilitation modalities and therapies to enhance workplace re-entry and return to daily activities, focusing on injury-specific rehabilitation protocols and comparative effectiveness research in therapy methods

## Childhood Musculoskeletal Conditions

- Perform high quality research studies regarding the surgical and nonsurgical management of pediatric trauma, including the development of injury prevention programs
- Identify the effects of childhood obesity on the musculoskeletal system such as fracture risk, slipped capital femoral epiphysis, Blount's disease, osteoarthritis, and low bone density
- Investigate the developmental biology of the musculoskeletal system in the child with an emphasis on bone and joint development, deformity, and dysplasia
- Design and develop orthopaedic devices that are appropriate for children and adolescents and expedite the FDA approval process for pediatric devices
- Investigate the genetic cause of scoliosis and develop optimal surgical and nonsurgical treatment methods



**For additional information, please contact the  
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**Contributing Societies:** American Orthopaedic Society for Sports Medicine (AOSSM); American Shoulder and Elbow Surgeons (ASES), Cervical Spine Research Society (CSRS); The Hip Society; Musculoskeletal Tumor Society (MSTS); North American Spine Society (NASS); Orthopaedic Research Society (ORS); Pediatric Orthopaedic Society of North America (POSNA); and Scoliosis Research Society (SRS).