Dear Friends,

As the population ages, it is important to improve the quality of life as we get older. Musculoskeletal diseases and disorders are the leading cause of disability as age increases. Men and women differ in musculoskeletal diseases and disorders, so it is essential to optimize sex-specific treatment and improve quality of life for the elderly.

We all know someone with osteoporosis, arthritis, hip/knee injuries, or increased joint pain in age. Understanding how men and women suffer from musculoskeletal conditions differently is critical in optimizing patient care. This edition of our monthly newsletter highlights notes from our most recent forum featuring Dr. Laura Bruse Gehrig who presented on sex differences in musculoskeletal health.

Sincerely,

The Institute Staff
Sexual dimorphism explains differences in biological responses that are inherent in one's sex or chromosomal make-up. As genes that are located on the X and Y chromosomes encode proteins that vary biochemical and physiologic pathways, sex differences can occur in different health body systems. In the musculoskeletal systems of males and females, females are found to have less muscle mass and different muscle fiber composition. Males, with higher levels of testosterone, have a higher muscle mass. Additionally, males and females inherit traits that specify bone size and shape, two functions that differ in men and women. Differing estrogen levels in men and women impacts growth plate closure, which suggests why, on average, men grow to be taller than women, and different sexes undergo different rates of growth.

These general sex differences inform more specific variance in musculoskeletal conditions between men and women.

**Osteoporosis**

Osteoporosis was traditionally thought of as a disease exclusively affecting postmenopausal women, but men are also affected by osteoporosis. The few studies that examine osteoporosis in males indicate that male onset of osteoporosis is 10 years later than onset in females. Osteoporosis, a weakening of the bone, can lead to increased risk of fracture. Males who sustain a hip fracture are more likely than women to sustain a second hip fracture and experience severe disability.

**Arthritis**

Arthritis involves joint inflammation causing severe pain that worsens with age. Osteoarthritis causes cartilage to break down and most commonly occurs in the hands, knees, hips, and spine. More females are affected by osteoarthritis than men and this may be due in part to:

- Fat distribution
- Shape of bones
- Alignment of limbs
- Cartilage thickness

Osteoarthritis has also been found to be higher in obese women, as fat cells make and store estrogen, and estrogen has a direct affect on cartilage. Leptin, a hormone made by fat cells are associated with osteoarthritis, and the higher the leptin levels, the greater the risk of osteoarthritis. As women already have higher leptin levels than men (cut to higher total body fat composition), women, and especially obese women, are more susceptible to osteoarthritis.
Other forms of arthritis, such as trapeziometacarpal (TMC) arthritis are more common in females than males and estrogen levels may play a significant role in onset of arthritis and severity in men and women.

**Spine**

Men and women differ in significant ways when comparing severity and onset of spine and back conditions. Scoliosis, for instance, is 10 times more common in young women than in men and results in greater spine curvature than men experience. Furthermore, females demonstrate a greater incidence of instability-related disorders whereas men show more disorders caused by structural deterioration.

These differences manifest themselves in back pain, as males experience an increase in back pain to age 50 and then decreases, while female back pain peaks at age 60.

**Knee**

With increased female athletes due to Title IX, female Anterior Cruciate Ligament (ACL) injuries are spiking. Researchers have begun looking into female ACL injuries and have found that females are likely at an increased risk for ACL injury when compared to males. Female ACL tears indicate an association with pre-ovulatory and perimenstrual timing, highlighting the influence of estrogen on collagen synthesis and degradation. Research also suggests the ways female land from jumps could create additional injury risk.

**Feet**

Anatomically, females have a wider forefoot, shorter arches, shorter metatarsals (MT’s), thinner cartilage, and greater foot flexibility than men. These anatomical differences in conjunction with gender differences in footwear lead to significantly different musculoskeletal conditions in the feet. Bunions occur at least twice as often in females as males, and females are nine times more likely than males to need corrective surgery. Bunions can result from women's shoes, but there is a much stronger maternal genetic component to this deformity.

Posterior Tibial Tendon Dysfunction (AKA Acquired Adult Flatfoot Deformity) can lead to deformity or complete loss of function of the posterior tibial tendon. 80% of people with this dysfunction are female, yet there is no explanation of this discrepancy as yet. One theory points to hormonal influence during perimenopause as the culprit, but further research is needed.
Concerns about Musculoskeletal Conditions

Sex differences in musculoskeletal conditions primarily revolve around estrogen levels in women. It is important to speak with your doctor about how your sex can impact your risk for musculoskeletal diseases and disorders. Becoming actively involved in monitoring your health can greatly decrease your health risks and increase your understanding of musculoskeletal conditions. Here are some ways to be active in controlling your health:

- Ask questions and don't be afraid to speak up when you need more clarifications from your doctor
- Involve friends and family in your care--having people who understand your health, limitations, and goals can help keep you on track
- Know your medical history--some musculoskeletal conditions are contingent on family health histories, injuries, and past surgeries, and knowing your past can help your clinicians plan for your future
- Compile a complete list of medications including over-the-counter medications, vitamins, and nutritional supplements--your doctors need to know your medication regimen to best help you
- Ask your doctor about supplemental educational resources; having more knowledge about your condition and treatment options improves your involvement in your health

It's important to understand your risks, symptoms, and treatment options if you are facing musculoskeletal conditions. Take control of your health and participate more in decisions about your healthcare.

Author: Laura M. Bruse Gehrig, MD, AAOS, Sanford Health, Bismarck, ND

Sources:
American Academy of Orthopaedic Surgeons

The American Academy of Orthopaedic Surgeons

The AAOS was founded in 1933 and is at the forefront of providing increased education and research on musculoskeletal conditions. Working to increase education, publications, public awareness, and patient advocacy, the AAOS meets regularly to discuss cutting edge research and advances in orthopaedics.

Please visit the AAOS Patient Education website to learn more about musculoskeletal diseases and disorders that differ by sex.

Treating Women Differently: The Case for Sex-Based Medicine
Since the passage of the NIH Revitalization Act of 1993, mandating the inclusion of women in federally funded clinical trials, there has been a growing body of evidence that sex differences are found in all body systems beyond reproductive health. The objectives of this conference are to highlight gender-based differences in diagnosis and treatment in the specific areas of Cardiology, Dermatology, Neurology, Psychiatry, and Pelvic Health.

**Friday, November 21, 2014**

Program: 12:00 pm - 5:00 pm.

Prentice Women's Hospital
350 E. Superior St., Chicago

To register: CLICK HERE

**Institute Happenings**

November 6, 2014 NIH Interdisciplinary Women's Health Research Symposium on "Sex Differences in Methodology and Reporting: Essentials for High-Impact Health Research." Keynotes include Dr. David Page of MIT's Whitehead Institute and NIDA Director Dr. Nora Volkow.

November 11, 2014 "The Social Behavior of Women and Men: Nature and Nurture Working Together" WHRI Monthly Forum featuring Alice Eagly, PhD

WHRI Blog and chief blogger, Sharon Green, have been nominated for the Wego Health Activist "Best in Show" Award. Staff blogger Megan Castle has also been nominated for the Wego Health "Rookie of the Year" award for the Institute's new teen health blog. Readers are encouraged to endorse Sharon and Megan by visiting this site.