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- No relationships to disclose

2026 PRIMARY CARE HAWAI'I CONFERENCE

MUSCULOSKELETAL SYNDROME OF MENOPAUSE

Diagnosing & Managing MSM in Your Active Patients

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FOR

PHYSICIANS

of Active Patients

MSM

Learning Objectives

01

Define the Musculoskeletal Syndrome of Menopause (MSM) and recognize its high prevalence in active perimenopausal and postmenopausal women

02

Identify the three core components of MSM — arthralgia/osteoarthritis, sarcopenia, and bone loss — and apply practical screening tools at routine office visits

03

Apply a multidisciplinary treatment approach — menopausal hormone therapy, resistance training prescription, and targeted nutrition — to active female patients with MSM

Why This Matters: The Scope of MSM

A landmark 2024 paper (Wright et al., Climacteric) — 175,000+ downloads — finally names what patients are experiencing

>70%

of women experience musculoskeletal symptoms across the menopause transition

25%

will be disabled by MSM — impacting daily activities and exercise capacity

≥50%

of perimenopausal women experience arthralgia (joint pain) specifically

175K+

downloads of Wright 2024 — global recognition of MSM as a clinical syndrome

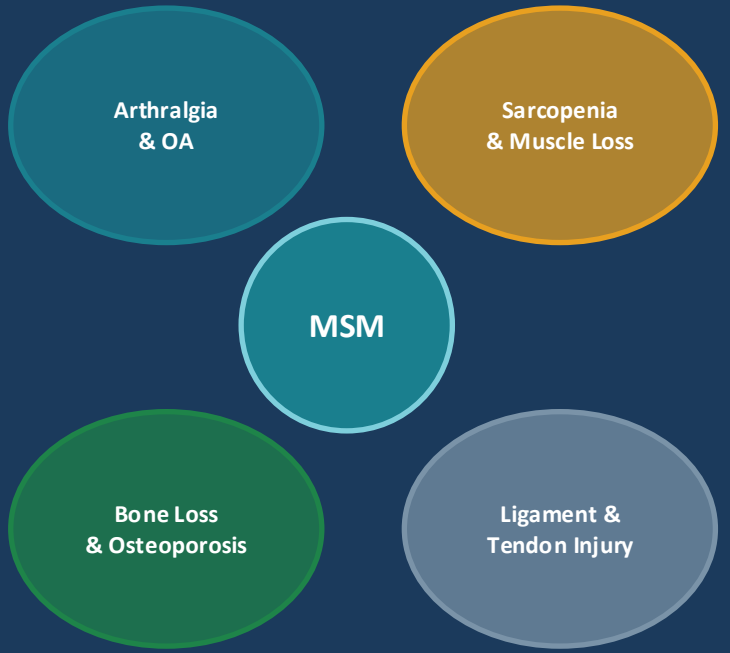
DEFINING THE SYNDROME

What Is the Musculoskeletal Syndrome of Menopause?

> *"A collective of musculoskeletal signs and symptoms associated with the loss of estrogen — encompassing arthralgia, sarcopenia, bone loss, and progression of osteoarthritis."*

— Wright VJ et al., Climacteric 2024

MSM COMPONENTS



WHY NAMING THIS SYNDROME MATTERS

Gives clinicians a unified framework
to recognize and treat the syndrome systematically
Gives patients language
to advocate for care that has more efficacy

Estrogen & the Musculoskeletal System

Why the loss of estradiol drives the entire syndrome — and why timing of intervention matters

ESTROGEN PROTECTS:

Bone:

Inhibits osteoclast activity; loss accelerates bone turnover 3–5%/year in early menopause

Muscle:

Maintains anabolic signaling (IGF-1, GH); loss → ↑ proteolysis, ↓ muscle protein synthesis

Cartilage:

Chondrocytes express estrogen receptors; withdrawal → ↑ MMP activity → OA acceleration

Tendons & Ligaments:

Estrogen maintains collagen cross-linking; loss → ↑ laxity, ↑ injury risk in active women

CLINICAL TIMELINE OF MSM

Perimenopause (~47–51 yrs)

↑ joint pain episodes; early muscle changes; irregular cycles

Menopause (~51 yrs average)

Arthralgia peaks; sarcopenia accelerates; bone loss rate highest

Early Postmenopause (1–5 yrs)

OA progression; ↑ fracture risk; tendon/ligament vulnerability ↑

Late Postmenopause (5+ yrs)

Established osteoporosis; severe sarcopenia; functional disability risk

Component 1: Arthralgia & Osteoarthritis

Most prevalent symptom of MSM

≥50%

of perimenopausal women report arthralgia (joint pain)

2–3×

higher OA progression rate post-menopause vs. premenopause

#1

most common MSM symptom — often misattributed to aging alone

MECHANISMS IN ACTIVE PATIENTS

Synovial Inflammation

Estrogen loss → ↑ IL-1β, TNF-α → synovitis, morning stiffness, warmth at joint line — common misdiagnosis as RA

Cartilage Degeneration

Chondrocytes express ERα & ERβ; estrogen withdrawal → ↑ MMP-3, MMP-13 → loss of cartilage thickness at weight-bearing surfaces

Subchondral Bone Changes

Coupled to osteoclast activation — OA accelerates at knee, hip, and hand joints (PIP joints); worse in heavier athletes

CLINICAL PEARL: When an active female patient in her late 40s–50s reports new joint pain without prior injury — consider MSM as the primary diagnosis.

Srikanth et al., OA Cartilage 2005 · Greendale et al. · Dugan et al

Component 2: Sarcopenia & Muscle Loss

Even active women lose muscle mass — the mechanism is hormonal, not just behavioral

WHAT HAPPENS TO MUSCLE

↓ IGF-1 & GH Signaling

Anabolic pathways suppressed — muscle protein synthesis declines even at the same training load

↑ Myostatin Activity

Estrogen normally suppresses myostatin; loss → ↑ myostatin → accelerated muscle catabolism

Type II Fiber Preferential Loss

Fast-twitch (power/speed) fibers lost first — critical impact on your performance-oriented patients

Myosteatosis (Fat Infiltration)

↓ Muscle quality independent of mass — force per unit area declines; injury risk ↑

IMPACT ON ACTIVE PATIENTS

1–2% muscle mass lost per year after age 50, accelerated in menopause

30% strength loss possible over 10 yrs postmenopause without intervention

⚠ **Standard labs will NOT flag early sarcopenia — ask about strength, falls, and exercise plateau directly**

Sternfeld et al., Menopause 2014 · Bea et al., WHI 2020

Component 3: Bone Loss, Osteopenia & Osteoporosis

Underscreened and underdiagnosed — even in patients who exercise regularly

3–5%

Bone density lost per year in early postmenopause (trabecular bone)

50%

of postmenopausal women will suffer an osteoporotic fracture in their lifetime

T < –2.5

DXA T-score threshold for osteoporosis — screen at menopause onset (or ≥65)

SCREENING PROTOCOL

DXA scan: ≥65 universally; earlier if risk factors (thin, smoking, steroids, fracture history)

FRAX score: 10-year fracture risk calculator — guides pharmacotherapy threshold

Labs: 25-OH VitD, Ca, PTH, CBC, TSH (secondary causes)

Exercise does NOT fully protect: active women still need DXA

BONE-PROTECTIVE TREATMENTS

MHT (estrogen): First-line for women <60 or <10 yrs postmenopause

Bisphosphonates: Alendronate, risedronate — if MHT not appropriate

RANK-L inhibitor: Denosumab for high fracture-risk patients

Nutrition: Ca 1,200 mg/day + VitD 1,500–2,000 IU/day + VitK2

"The woman who fractures her hip at 70 started losing bone at 49. The intervention window is now."

NOF Clinical Guide 2022 · USPSTF DXA Recommendations · Menopause Society 2022 · Wright et al. Climacteric 2024

Recognizing MSM in Your Office

The diagnosis starts with asking the right questions — the framework is now evidence-based

SCREEN FOR THESE SYMPTOMS

- Joint pain or stiffness (especially morning)
- ↓ Exercise tolerance / performance plateau
- New muscle weakness or unexplained fatigue
- Increased injury rate or slow recovery

3 KEY QUESTIONS TO ASK

1. "Have you noticed changes in your joint comfort or strength in the past year?"

2. "Has your exercise performance changed — are you hitting a wall you can't explain?"

3. "Have you had a bone density test? Any recent fractures from minor trauma?"

DIFFERENTIAL DIAGNOSIS CONSIDERATIONS

Rheumatoid Arthritis

ANA, RF, anti-CCP; symmetric small joints; can worsen with menopause — not exclusive

Hypothyroidism

TSH — fatigue, myalgia, weight gain overlap with MSM; rule out early

Vitamin D Deficiency

25-OH VitD — diffuse musculoskeletal pain and weakness; very common

Fibromyalgia

Central sensitization; may be exacerbated or unmasked by estrogen loss

Overtraining Syndrome

Performance ↓ + fatigue in athletes; may coexist with MSM in active women

Treatment Pillar 1: Menopausal Hormone Therapy (MHT)

Evidence-based first-line therapy for MSM — address WHI misconceptions directly with patients

MSK BENEFITS OF MHT

Arthralgia:
Reduces joint pain; arthralgia improves within weeks of MHT initiation in most women

Sarcopenia:
Preserves muscle mass & strength; effects synergistic with resistance training

Bone Density:
Prevents/slows bone loss; reduces hip & vertebral fracture risk ~30–40%

OA Progression:
May slow cartilage loss; knee OA incidence lower in MHT users (observational data)

Active Life:
Exercise tolerance, sleep, and mood improve — patients can train harder, recover faster

PRESCRIBING FRAMEWORK (REFER / CO-MANAGE)

Best window: <60 yrs or <10 yrs postmenopause ("timing hypothesis")

Preferred route: Transdermal estradiol — lower VTE risk vs. oral

Progestogen: Micronized progesterone if uterus intact (safest data)

Duration: No arbitrary limit — individualize risk-benefit annually

ABSOLUTE CONTRAINDICATIONS

Unexplained vaginal bleeding · Active/recent breast cancer · Active CVD or stroke · Prior DVT/PE · Liver disease

WHI CONTEXT: WHI studied older, predominantly obese women on oral CEE/MPA — not representative of transdermal MHT in perimenopausal women.

Treatment Pillar 2: Exercise Prescription

Resistance training is the single most important non-pharmacologic intervention for MSM

KEY PRINCIPLE: The exercise stimulus must be progressive and specific — recreational walking alone is insufficient to reverse MSM

PRIORITY #1

Resistance Training

- 2–3×/week; multi-joint compound movements
- Progressive overload: ↑ load 5–10% as strength improves
- 3–4 sets × 6–12 reps at 65–80% of 1RM
- Counteracts sarcopenia AND improves bone density
- Synergistic with MHT — greater effect than either alone

PRIORITY #2

Weight-Bearing Aerobic

- 150 min/week moderate or 75 min vigorous intensity
- Walking, running, dance — weight-bearing > aquatic for bone
- High-impact (if tolerated): osteogenic stimulus for bone
- Reduces systemic inflammation — addresses arthralgia directly
- HIIT 2×/week: additional metabolic + muscular benefits

PRIORITY #3

Balance & Flexibility

- Yoga, tai chi, Pilates: ↓ fall risk — critical with osteoporosis
- Daily stretching: addresses MSM joint stiffness and morning pain
- Proprioception training: ligament laxity ↑ with estrogen loss
- Pelvic floor training: often neglected in active menopausal women
- Minimum 2×/week dedicated balance training for women ≥50

ACSM Guidelines for Exercise Testing and Prescription (11th ed.) · NAMS Exercise in Menopause 2023 · Wright et al. Climacteric 2024

Progressive Resistance Training

- PRT preserves and rebuilds lean mass in postmenopausal women
- Stimulates bone formation via mechanical loading — critical at spine and hip
- LIFTMOR Trial: HiRIT improved lumbar spine BMD ~3% and femoral neck BMD — no fractures
- Protein requirements: ≥1.2–1.6 g/kg/day to overcome anabolic resistance
- PRT Non-negotiable — synergistic with MHT, effective even without it

LIFTMOR Randomized Clinical Trial:
Supervised HiRIT in postmenopausal women with low bone mass produced ~3% gain in spinal BMD with zero adverse events

Watson et al., LIFTMOR, JBMR 2018 · Liu & Latham, Cochrane · Bauer et al., ESPEN

Treatment Pillar 3: Nutrition & Supplementation

Protein, calcium, vitamin D, and creatine — evidence-based targets for active patients

Protein — 1.2–1.6 g/kg/day

Counteracts anabolic resistance; post-exercise protein timing is critical to maintain MPS rate

Meat, fish, eggs, dairy, legumes · Distribute across meals — 30–40 g per meal

Bauer et al., JAMDA 2013 · PROT-AGE Study Group

Calcium — 1,000–1,200 mg/day

Maintains bone mineral density; dietary sources preferred to limit CV risk of high-dose supplements

Dairy, leafy greens, fortified foods · Ca-citrate preferred if patient is on a PPI

NOF Clinical Guide 2022 · Bolland et al., BMJ 2010

Vitamin D — 1,500–2,000 IU/day

Deficiency very common in symptomatic women; critical for Ca absorption AND muscle function

Target serum 25-OH VitD: 40–60 ng/mL · Test and treat to target; D3 preferred

Holick et al., JCEM 2011 · Endocrine Society CPG

Creatine — 3–5 g/day

Emerging evidence: enhances resistance training outcomes for muscle mass and bone in postmenopausal women

Creatine monohydrate — safe long-term; most benefit when combined with resistance training

Candow et al., Bone 2019 · Smith-Ryan et al., Med Sci Sports Exerc 2021

Also advise: Mediterranean / anti-inflammatory diet pattern · Limit alcohol (bone & muscle toxin) · Adequate hydration · Vitamin K2 (bone health)

Clinical Action Plan for Primary Care Physicians

What to do at the next visit with your perimenopausal or postmenopausal active patient

1

ASK

Screen for MSM: joint pain, strength loss, exercise plateau, prior fractures.

2

ASSESS

Order DXA if not done (≥50 with risk factors or fracture). Check 25-OH VitD and secondary cause labs. Calculate FRAX. Assess muscle function with grip strength or sit-to-stand test.

3

ADVISE

Prescribe resistance training specifically (2–3×/week, progressive overload). Counsel on protein ≥1.2 g/kg, calcium, vitamin D targets. Address MHT candidacy; correct WHI myths.

4

ACT / REFER

Initiate MHT or refer to menopause specialist. Refer to physical therapy for exercise prescription. Coordinate with rheumatology if inflammatory arthritis overlap suspected.

Key message: MSM is prevalent, undertreated, and highly manageable!

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THANK YOU!
QUESTIONS?

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KEY REFERENCES

1. **Wright VJ, Schwartzman JD, Itinoche R, Wittstein J. The musculoskeletal syndrome of menopause. Climacteric. 2024;27(5):466–472. PMID 39077777.**

2. The Menopause Society (NAMS). 2022 Hormone Therapy Position Statement. Menopause. 2022;29(7):767–794.

3. Bauer J, et al. Evidence-based recommendations for optimal dietary protein intake in older people. J Am Med Dir Assoc. 2013; 14(8):542–559.

4. Candow DG, et al. Creatine supplementation for older adults: focus on sarcopenia, osteoporosis, frailty and cachexia. Bone. 2019;162:116467.

5. National Osteoporosis Foundation. Clinician's Guide to Prevention and Treatment of Osteoporosis. NOF; 2022.

6. Holick MF, et al. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society Clinical Practice Guideline. J Clin Endocrinol Metab. 2011;96(7):1911–1930.

7. Khadilkar SS. Musculoskeletal disorders and menopause. J Obstet Gynaecol India. 2019;69(2):99–103.

8. American College of Sports Medicine. ACSM's Guidelines for Exercise Testing and Prescription. 11th ed. Wolters Kluwer; 2021.

Thank you for your attention. Questions?