AMERICAN ACADEMY OF FAMILY PHYSICIANS

AAFP Reprint No. 265

Recommended Curriculum Guidelines for Family Medicine Residents

Musculoskeletal and Sports Medicine

This document is endorsed by the American Academy of Family Physicians (AAFP).

Introduction

Each family medicine residency program is responsible for its own curriculum. The AAFP Commission on Education's Subcommittee on Graduate Curriculum has created this guide as an outline for curriculum development, and it should be tailored to the needs of the program.

Through a series of structured and/or longitudinal experiences, the curricula below will support the overall achievement of the core educational competencies defined by the Accreditation Council for Graduate Medical Education (ACGME) and provide guideposts to program requirements specific to family medicine. For updates and details, please refer to the ACGME website at www.acgme.org. Current AAFP Curriculum Guidelines may be found online at www.aafp.org/cg. These guidelines are periodically updated and endorsed by the AAFP and, in many instances, other specialty societies, as indicated on each guideline.

Preamble

The approach to diseases and disorders of the musculoskeletal system requires specific attitudes, knowledge, and skills. Residency education is designed to provide experiences in a variety of settings that will give residents expertise in the diagnosis, prevention, treatment, and rehabilitation of musculoskeletal diseases. These experiences should include patients of all ages and conditions with congenital, traumatic, and degenerative causes.

In the United States, the combined burden of medical conditions affecting the

musculoskeletal system and preventable chronic diseases that are related to improper nutrition and inactivity is staggering. Musculoskeletal complaints are a common reason for seeking medical attention. Yet, studies indicate musculoskeletal and sports medicine education in U.S. medical schools (Weiss 2015) and primary care residencies (Dietrich 2020) may be inadequate. The attitudes, knowledge, and skills outlined in this Curriculum Guideline will equip family medicine training programs to provide optimal care to prevent musculoskeletal complaints and treat patients who have musculoskeletal complaints.

Patient Care

At the completion of residency training, a family medicine resident should be able to provide patient care that encompasses the following:

1. Musculoskeletal injuries and conditions
    a. Obtain a history specific for musculoskeletal injuries or conditions and perform a physical examination of the musculoskeletal system, including performing special tests, where and when indicated; evaluating the associated neurovascular status; and ordering and interpreting basic imaging studies. This also includes on-field assessment and management, as indicated. A family medicine resident shall formulate a relevant differential diagnosis, recommend treatment, understand the associated pathophysiology, and understand how to classify or describe a range of musculoskeletal injuries and conditions, including, but not limited to:
        i. So-called “red flag” musculoskeletal injuries, which require urgent referral for operative management and are associated with urgent medical problems (e.g., acute compartment syndrome, knee or hip dislocation, cancer), or conditions for which non-healing or non-union are common or particularly problematic
        ii. Bone injuries and conditions
            1. Fractures, when operative management is not indicated, e.g., avulsion; non- or minimally/mildly angulated, displaced, or depressed; stable; or reducible fractures of:
                a. Tarsals, metatarsals, and toe phalanges
                b. Medial and lateral malleoli
                c. Greater and lesser trochanter
                d. Carpals, metacarpals, and finger phalanges
                e. Distal radius, radial head, or isolated ulnar shaft
                f. Medial or lateral humeral epicondyle
                g. Midshaft clavicle
                h. Rib
                i. Spinous process (clay shoveler’s)
                j. Apophyseal sites
                    i. Calcaneus
                    ii. Tibial tubercle
                    iii. Anterior superior iliac spine
                k. Epiphyseal sites (Salter-Harris I or II classification

only)
i. Lateral malleolus
ii. Base of the fifth metatarsal
2. Stress injuries
a. Medial tibial stress syndrome
b. Stress fractures
3. Metabolic bone problems (osteoporosis, Paget disease of bone, rickets)
4. Osteomyelitis

iii. Ligament injuries and conditions
1. Joint dislocations
2. Tears
3. Sprains
4. Chronic laxity/instability

iv. Musculotendinous/fascia injuries and conditions
1. Tears
2. Strains
3. Contusions
4. Myositis ossificans
5. Impingement
6. Cramps/spasm
7. Atrophy
8. Tendonosis/fasciosis

v. Cartilage/fibrocartilage injuries and conditions
1. Fracture
2. Chondrosis
3. Chondritis
4. Tear
5. Degeneration

vi. Cysts and masses
1. Ganglions
2. Baker cysts
3. Musculoskeletal tumors

vii. Arthritis
1. Osteoarthritis
2. Crystal arthropathy
3. Inflammatory/autoimmune arthropathies

viii. Pain conditions manifesting as musculoskeletal problems
1. Fibromyalgia
2. Myofascial pain syndrome
3. Low back pain

ix. Congenital or acquired musculoskeletal conditions
1. Scoliosis
2. Pes planus/cavus
3. Femoral versions/tibial torsions
4. Patella alta/baja

5. CAM lesions
6. Slipped capital femoral epiphysis (SCFE)

b. Provide rehabilitation prescription and oversight for ill and injured athletes and return-to-play decision making
    1. Prescribe home exercise programs for musculoskeletal injuries

2. Medical sports medicine issues and conditions
    a. Obtain a history specific for medical sports medicine issues and conditions or medical conditions that may be affected by athletic participation; perform a physical examination specific to the related organ systems, as indicated; and perform, order, or refer for further testing, as indicated. This also includes on-field assessment and management, as indicated. A family medicine resident shall formulate a relevant differential diagnosis, recommend treatment, understand the associated pathophysiology, and understand how to classify or describe a range of medical sports medicine issues and conditions, including, but not limited to:
        i. Neurologic
            1. Concussions
            2. Attention-deficit/hyperactivity disorder
            3. Spinal cord injuries
            4. Nerve entrapment syndromes
            5. Neuromas
            6. Brachial plexopathies
            7. Thoracic outlet syndrome
        ii. Cardiac
            1. Sudden cardiac death
            2. Congenital cardiac conditions
            3. Exercise-associated syncope
            4. Exercise-associated chest pain
            5. Exercise-associated arrhythmias
        iii. Respiratory
            1. Exercise-induced asthma/anaphylaxis
            2. Exercise-induced laryngeal obstruction/vocal cord dysfunction
        iv. Gastrointestinal
            1. Exercise-associated motility issues
        v. Genitourinary
            1. Genital trauma
        vi. Endocrine
            1. Diabetes
        vii. Immunologic and hematologic
            1. Sickle cell trait
            2. Overtraining syndrome
            3. Iron/ferritin deficiency
        viii. Nutrition

1. Relative energy deficiency syndrome

ix. Skin and soft tissue
    1. Common dermatologic conditions in sports
    2. Soft tissue infections
    3. Sport-specific rules related to acute skin conditions

x. Special organs
    1. Ocular or orbit trauma

b. Physical activity as prevention or treatment
    i. Provide recommendations for physical activity for the general population
    ii. Tailor physical activity recommendations to the individual patient based on medical conditions or risk factor analysis to treat or prevent disease or disease progression
    iii. Understand indications for cardiac screening for exercise-related cardiac problems
    iv. Formulate and monitor appropriate individualized exercise prescriptions for pregnancy and conditions such as obesity and diabetes

3. Psychological sports medicine issues or conditions
    a. Obtain a history specific for psychological sports medicine issues or conditions, or psychological conditions that may be affected by athletic participation. Perform a neuropsychological examination, as indicated, and perform, order, or refer for further testing, as indicated. A family medicine resident shall formulate a relevant differential diagnosis, recommend treatment, understand the associated pathophysiology, and understand how to classify or describe a range of psychological sports medicine issues and conditions, including, but not limited to:
        i. Bullying/hazing
        ii. Burnout
        iii. Dealing with loss of sport or separating from sport
        iv. Sexual violence in sports
        v. Substance use and abuse

4. Environmental sports medicine issues and injuries
    a. Assess for environmental conditions that may adversely impact participants and provide corrective measures, such as modifying or limiting participation to prevent injuries due to environmental conditions, as indicated. Treat environmental injuries that arise during the course of participation.
        i. Heat stress, including heat cramps, exhaustion, stroke (including rapidly cooling and cooling before transport)
        ii. Management of athletes dealing with other pertinent environmental factors (e.g., cold, altitude, poor air or water quality)

5. Field-side coverage of sports, including providing basic evaluation and

management, implementing emergency action planning, and working with the sports medicine team to determine return to play

6. Preparticipation evaluations
    a. Age-specific or sport-/level-specific recommendations/requirements
    b. Medical condition-specific recommendations/requirements
    c. Unpaired organ considerations
    d. Congenital conditions and relative and absolute contraindications to sports
    e. The role of various forms of cardiac preparticipation screening

7. Athlete groups with special care needs
    a. Female athletes
    b. Transgender athletes
    c. Athletes with disabilities/parasport athletes

8. Office-based musculoskeletal procedures
    a. Explain indications and contraindications, risks and benefits, and potential complications
    b. Perform common office-based musculoskeletal procedures such as:
        i. Aspirations/injections
            1. Joints/bursas
            2. Tendons/ligaments
        ii. Splinting and casting (upper and lower extremity)
        iii. Dislocation reduction
            1. Simple anterior shoulder
            2. Radial head
            3. Phalanges
            4. Patella

9. Evaluate the need for supportive/corrective devices, including braces, casts, splints, and orthotics, and prescribe as indicated

10. Counsel on expected surgical and post-operative course and refer as indicated

Medical Knowledge

At the completion of residency training, a family medicine resident should be able to:

1. Demonstrate the ability to apply knowledge of the following:
    a. Normal anatomy and physiology, including basic exercise physiology (e.g., cardiovascular effects of exercise) and biomechanics (e.g., normal mechanics of gait and foot strike)
    b. Normal and abnormal growth and development, including congenital or acquired conditions
        i. Avascular necrosis of the femoral head (Legg-Calvé-Perthes disease)
        ii. Slipped capital femoral epiphysis (SCFE)

iii. “Clubfoot” (talipes equinovarus)
iv. Intoeing, pes planus, genu varum, genu valgum
v. Physeal injuries (Salter-Harris classification)
vi. Greenstick fracture
vii. Buckle/torus fracture
viii. Dislocation of the radial head (nursemaid’s elbow)
ix. Thoracolumbar scoliosis

c. Components of a complete musculoskeletal patient history
d. Principles and components of musculoskeletal physical examination (e.g., knee, shoulder, hip, elbow, wrist, hand, neck, back, foot, and ankle), including the role and accuracy of special tests
e. Pathogenesis, pathophysiology, and expected normal healing process of:
    i. Bone, cartilage, ligament, tendon, and nerve
        1. Microtraumatic and macrotraumatic injury patterns
    ii. Fractures and dislocations
    iii. Bone and joint infections
    iv. Metabolic bone diseases
    v. Avascular necrosis
    vi. Osteoporosis
    vii. Concussion
f. Recognition of child abuse patterns of injury
g. Injury prevention
    i. Use of proper techniques
    ii. Promotion of rule changes and enforcement of rules designed to enhance participant safety
    iii. Proper equipment, fit, and maintenance
    iv. Environmental factors affecting participant and spectator safety (including prevention of heat illness and hypothermia, and lightning safety)
h. Conditioning and training techniques, including principles of aerobic and resistance training
i. Psychosocial impact of sport/physical activity on patients
j. Nutrition, fluids and electrolytes, and dietary supplements and their role in sports
    i. Awareness of banned substances in training and competition
k. Role and interpretation of laboratory data (e.g., joint fluid)
l. Indications for ordering and interpretation of common radiologic and diagnostic tests, including:
    i. Plain radiographs, magnetic resonance imaging (MRI), computed tomography (CT), bone scan, ultrasound
    ii. Electromyography (EMG) and nerve conduction studies

2. Explain components of an appropriate exercise prescription for:
    a. Healthy people of all ages
    b. Patients who have chronic illnesses, including diabetes, hypertension, stable heart failure, asthma, and chronic obstructive pulmonary disease

(COPD)
   c. Pregnant individuals
   d. Physically or mentally challenged athletes
   e. Patients who have various cardiovascular conditions, especially those known to increase the risk of sudden death

3. Understand problems that are associated with or arise because of exercise
   a. Exercise addiction
   b. Abuse of anabolic steroids and other performance-enhancing substances
   c. Pressure placed on athletes by themselves, family members, teammates, coaches, and fans to participate even when injured
   d. Performance pressure placed on athletes by themselves, family members, teammates, coaches, and fans
   e. The need to deal with unmet and unrealized expectations
   f. Alcohol and illicit drug use and abuse
   g. Eating disorders and disordered eating
   h. Relative energy deficiency in sport (RED-S) syndromes (female athlete triad, male athlete triad)
   i. Mental health issues

4. Understand principles of rehabilitation
   a. Physical therapy
      i. Role of restorative exercise
      ii. Therapeutic modalities (including those that are evidence based and those that lack evidence to support)
   b. Occupational therapy
   c. Complementary modalities (e.g., osteopathic manipulative therapy [OMT], massage, acupuncture)
   d. Psychosocial aspects of rehabilitation and recovery

5. Understand the indications for surgery and follow-up care for common musculoskeletal injuries and conditions

6. Demonstrate knowledge of special medical and musculoskeletal care considerations for certain athlete groups
   a. Preadolescent
   b. Adolescent
   c. Female
   d. Geriatric
   e. Physically challenged (including those participating in the Special Olympics and Paralympics)
   f. Student
   g. Recreational
   h. Transgender
   i. Pregnant

7. Identify medical needs for mass participation events

Interpersonal and Communication Skills

Residents should be able to communicate and interact effectively regarding sports medicine and musculoskeletal health care with a wide range of individuals, including the following:

- Patients/athletes
- Family members
- Coaching staff
- School administrators
- Employers
- Athletic trainers
- Physical therapists
- Dieticians
- Other allied health professionals
- Other members of the sports medicine team
- The media

Systems-Based Practice

At the completion of residency, a family medicine resident should be able to:

- Coordinate care within the health care system to include appropriate subspecialists, physical therapists, and athletic trainers
- Understand the roles of the medical team in community-based events and competitions and mass participation events
- Promote safe athletic participation through sports medicine education for patients and their families, allied health professionals, coaches, and school administrators
- Understand the different requirements of the Health Insurance Portability and Accountability Act (HIPAA) and the Family Educational Rights and Privacy Act (FERPA) and how they may affect the release of health or academic information

Practice-Based Learning and Improvement

At the completion of residency, a family medicine resident should be able to:

- Become familiar with national guidelines, such as the American College of Sports Medicine (ACSM) and American Medical Society for Sports Medicine (AMSSM) consensus statements
- Apply current evidence-based imaging guidelines to patient care (e.g., Ottawa ankle rules and pediatric head injury algorithms)
- Be aware of performance metrics pertaining to musculoskeletal conditions and how the data may improve delivery of care to one’s patient population
- Engage in continuous self-improvement and respond with positive changes to feedback from members of the health care team

Professionalism

Residents are expected to conduct themselves in a professional manner in their interactions with patients, athletes, families, and other members of the health care team and in all clinical, sideline, and athletic training room settings. Additionally, family medicine residents are expected to demonstrate their ability to do the following:

- Recognize limits of their knowledge and use other professionals for assistance when needed
- Understand the importance of diagnosing and treating musculoskeletal injuries and sports medicine-related conditions in family medicine
- Commit to the continued acquisition of knowledge and skills in the diagnosis and management of sports medicine and musculoskeletal conditions within family medicine
- Understand that sports medicine involves caring for the whole athlete, including medical and psychological conditions in addition to musculoskeletal conditions
- Understand ethical issues in sports medicine

Implementation

This Curriculum Guideline should be implemented longitudinally throughout the three years of residency training. Research has shown that early exposure to a sports medicine curriculum enhances basic medical knowledge in musculoskeletal medicine (Watts 2011). The continuing patient care experience in the family medicine center provides the principal site for training in ambulatory musculoskeletal care. Residents should have at least minimal experience in inpatient orthopedics. Preceptors who are competently trained must be available to work individually with residents and to teach and assess performance of residents' desired skills.

The teaching of musculoskeletal care lends itself well to hands-on training in core conferences and workshops using films, patient demonstrations, and models. Experience can be provided in bone, muscle, and joint examination; splinting; taping; casting; arthrocentesis; and rehabilitative measures. Additional training sites that have proven useful include private orthopedic offices; emergency departments; sports medicine and rehabilitation centers; game-time sidelines care sites; and specialized clinics, including adult back, scoliosis, and foot clinics. Electives can serve to consolidate orthopedic training, to expose the resident to a greater concentration of common problems, or to provide experience with unusual problems (e.g., acute ski injury clinics, military bases, paratrooper training, gait and balance clinics for the elderly).

Resources

Articles

American Family Physician (*AFP*) by Topic: Musculoskeletal Care. (Multiple articles)
www.aafp.org/afp/topicModules/viewTopicModule.htm?topicModuleId=17

Cassas KJ, Cassettari-Wayhs A. Childhood and adolescent sports-related overuse injuries. *Am Fam Physician*. 2006;73(6):1014-1022.

Dietrich K, Hutchinson E, Lu MD. Advanced primary care orthopedics: bridging the gap in musculoskeletal education. *Fam Med*. 2020;52(6):444-447.

Freedman KB, Bernstein J. The adequacy of medical school education in musculoskeletal medicine. *J Bone Joint Surg Am*. 1998;80(10):1421-1427.

Macdonald J, Schaefer M, Stumph J. The preparticipation physical examination. *Am Fam Physician*. 2021;103(9):539-546.

McCrory P, Meeuwisse W, Dvořák J, et al. Consensus statement on concussion in sport: the 5th international conference on concussion in sport held in Berlin, October 2016. *Br J Sports Med*. 2017;51:838-847.

Mills BM, Conrick KM, Anderson S, et al. Consensus recommendations on the prehospital care of the injured athlete with a suspected catastrophic cervical spine injury. *J Athl Train*. 2020;55(6):563-572.

Scorza KA, Cole W. Current concepts in concussion: Initial evaluation and management. *Am Fam Physician*. 2019;99(7):426-434.

Watts SA, Zhang Z. Competency in musculoskeletal and sports medicine: evaluating a PGY-1 curriculum. *Fam Med*. 2011;43(9):659-663.

Weiss K, Curry E, Matzkin E. Assessment of medical school musculoskeletal education. *Am J Orthop* (*Belle Mead NJ*). 2015;44(3):E64-E67.

Woodwell DA, Cherry DK. National Ambulatory Medical Care Survey: 2002 summary. *Adv Data*. 2004;(346):1-44.

Books

Primary Resources (recommended for all residencies):

American College of Sports Medicine. *ACSM's Guidelines for Exercise Testing and Prescription*. 10th ed. Lippincott Williams & Wilkins; 2017.

Armstrong AD, Hubbard MC, eds. *Essentials of Musculoskeletal Care*. 5th ed. American Academy of Orthopaedic Surgeons; 2015.

Bernhardt DT, Roberts WO, eds. *PPE: Preparticipation Physical Evaluation*. 5th ed. American Academy of Pediatrics; 2019.

Eiff MP, Hatch RL. *Fracture Management for Primary Care and Emergency Medicine*.

4th ed. Elsevier; 2019.

Jacobsen JA. *Fundamentals of Musculoskeletal Ultrasound*. 3rd ed. Elsevier; 2017.

Liguori G. *ACSM's Guidelines for Exercise Testing and Prescription.* 11th ed. Lippincott Williams & Wilkins; 2021.

McKeag DB, Moeller JL. *ACSM's Primary Care Sports Medicine*. 2nd ed. Lippincott Williams & Wilkins; 2007.

McNabb JW. *A Practical Guide to Joint & Soft Tissue Injections*. 3rd ed. Lippincott Williams & Wilkins; 2014.

Secondary Resources (to supplement primary resources):

Fowler GC. *Pfenninger and Fowler's Procedures for Primary Care*. 4th ed. Elsevier; 2020.

Miller MD, Thompson SR. *DeLee, Drez and Miller's Orthopaedic Sports Medicine: Principles and Practice*. 5th ed. Elsevier; 2020.

O'Connor FG. *ACSM's Sports Medicine: A Comprehensive Review*. Lippincott Williams & Wilkins; 2012.

Website Resources

American Board of Family Medicine. Sports Medicine Examination Content; 2019. https://www.theabfm.org/sites/default/files/2019-03/SportsMedExaminationOutline.pdf

American Medical Society for Sports Medicine Publications and Positions Statements. https://www.amssm.org/Publications.php

Bryan S, Heiman D, Hong E, et al. Evidence-based musculoskeletal examination: faculty development for competence in teaching musculoskeletal examination techniques; 2007. http://slideplayer.com/slide/10282655/

Gentili A, Beller M, Masih S, et al. Interactive Atlas of Signs in Musculoskeletal Radiology. www.gentili.net/signs/

National Athletic Trainers' Association Consensus Statements. https://www.nata.org/news-publications/pressroom/statements/consensus

University of California, San Diego (UCSD). A Practical Guide to Clinical Medicine: Musculo-Skeletal Examination; 2015. http://meded.ucsd.edu/clinicalmed/joints.htm

University of West Alabama Athletic Training & Sports Medicine Center. AH 323

Evaluation of Athletic Injuries I Laboratory. Shoulder Special Tests. Athletic Injury/Illness Special Tests. http://at.uwa.edu/CurrHome/AH323/skillsshoulder.asp

Organizations

American Academy of Family Physicians. www.aafp.org

American Academy of Orthopaedic Surgeons. www.aaos.org

American College of Radiology. http://acr.org

American College of Rheumatology. www.rheumatology.org

American College of Sports Medicine. www.acsm.org

American Medical Society for Sports Medicine. www.amssm.org

American Orthopaedic Society for Sports Medicine. www.sportsmed.org

Arthritis Foundation. http://arthritis.org

Exercise is Medicine. Healthcare Providers. https://www.exerciseismedicine.org/eim-in-action/health-care/health-care-providers/

National Collegiate Athletic Association. NCAA Banned Substances. https://www.ncaa.org/sports/2015/6/10/ncaa-banned-substances.aspx

Society of Teachers of Family Medicine. www.stfm.org

World Anti-Doping Agency. www.wada-ama.org/

Reviewed 2008 by American Medical Society for Sports Medicine (AMSSM), Leawood, KS, and the University of Connecticut-St. Francis Family Medicine Residency Program, Hartford
Revised 04/2009
Revised 08/2013 by East Tennessee State University Family Medicine Residency Program, Johnson City, TN
Revised 07/2017 by East Tennessee State University Family Medicine Residency Program and AMSSM
Revised 10/2021 by Society of Teachers of Family Medicine (STFM), Musculoskeletal and Sports Medicine Education Collaborative, Leawood, KS