Body System: Musculoskeletal		
Session Topic: Splinting, Casting, and Wrapping		
Educational Format		**Faculty Expertise Required**
Clinical Procedural Workshop (CPW)		Expertise in the field of study. Experience teaching in the field of study is desired. Preferred experience teaching hands-on procedural workshops. The majority of the education must emphasize hands-on learning, with feedback from faculty.
OPTIONAL	Problem-Based Learning (PBL)	Expertise teaching highly interactive, small group learning environments. Case-based, with experience developing and teaching case scenarios for simulation labs preferred. Other workshop-oriented designs may be accommodated. A typical PBL room is set for 50-100 participants, with 7-8 each per round table. Please describe your interest and plan for teaching a PBL on your proposal form.

Professional Practice Gap	**Learning Objective(s) that will close the gap and meet the need**	**Outcome Being Measured**
• There exist knowledge gaps to effectively assess injured bones or soft tissue to determine the stage and severity of the injury and determine the most effective mechanism of treatment. • There exist knowledge gaps regarding custom splinting techniques. • There exist knowledge gaps in the evaluation of appropriate imaging modalities for patients with acute or chronic injuries that require diagnostic imaging evaluation.	1. Assess injured bones or soft tissue to determine the stage and severity of the injury and determine the most effective mechanism of treatment. 2. Compare the indications for using casts, splints or wrapping and taping. 3. Evaluate appropriate imaging modalities for patients with acute or chronic injuries that require diagnostic imaging evaluation.	Learners will submit written commitment to change statements on the session evaluation, indicating how they plan to implement presented practice recommendations.

ACGME Core Competencies Addressed (select all that apply)			
X	Medical Knowledge		Patient Care
	Interpersonal and Communication Skills		Practice-Based Learning and Improvement
	Professionalism		Systems-Based Practice

Faculty Instructional Goals

Faculty play a vital role in assisting the AAFP to achieve its mission by providing high-quality, innovative education for physicians, residents and medical students that will encompass the art, science, evidence and socio-economics of family medicine and to support the pursuit of lifelong learning. By achieving the instructional goals provided, faculty will facilitate the application of new knowledge and skills gained by learners to practice, so that they may optimize care provided to their patients.

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- Provide up to 3 evidence-based recommended practice changes that can be immediately implemented, at the conclusion of the session; including SORT taxonomy & reference citations
- Facilitate learner engagement during the session
- Address related practice barriers to foster optimal patient management
- Provide recommended journal resources and tools, during the session, from the American Family Physician (AFP), Family Practice Management (FPM), and Familydoctor.org patient resources; those listed in the References section below are a good place to start
    - Visit http://www.aafp.org/journals for additional resources
    - Visit http://familydoctor.org for patient education and resources
- Provide learners with an opportunity to practice and receive feedback regarding the assessment of injured bones or soft tissue to determine the stage and severity of the injury and determine the most effective mechanism of treatment.
- Provide learners with an opportunity to practice and receive feedback regarding the indications for using casts, splints or wrapping and taping.
- Provide learners with an opportunity to practice and receive feedback regarding the evaluation of appropriate imaging modalities for patients with acute or chronic injuries that require diagnostic imaging evaluation.

Needs Assessment

Musculoskeletal diseases, which include back pain, arthritis, bodily injuries and osteoporosis, are reported by people in the U.S. more than any other health condition. It is estimated that nearly 108 million adults (or one in two people over the age of 18) report suffering from a musculoskeletal condition lasting three months or longer. In addition, nearly 15 million adults report they are unable to perform at least one common activity, such as self-care, walking or rising from a chair, on a regular basis due to their musculoskeletal condition.[1] According to the recent publishing of *The State of US Health, 1990-2010 Burden of Diseases, Injuring, and Risk Factors*; musculoskeletal disorders are among the largest contributors to patients living years with disability (YLD), and has increased 30% from 1990 to 2010.[2]

In a recent American Academy of Family Physicians (AAFP) Common Medical Procedures CME Needs Assessment Survey, 11.3% of those responding indicated a need for basic training with regard to casting and splinting, and 9.6% indicated a need for advanced training with regard to casting and splinting.[3] CME outcomes data from 2015 AAFP FMX *Splinting, Wrapping, Casting and Taping* sessions suggest that physicians have practice gaps with regard to custom splinting; casting and splinting efficacy; and determining most appropriate and cost effective supplies.[4]

- Over 50% of learners indicated plans to implement what they learned from these sessions.
- Over 93% of learners indicated that this training will improve their performance of these procedures.

Consider the following statistics from the CDC:

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- The *2009 Health of the U.S.* publication reported that arthritis and other musculoskeletal conditions were the leading causes of activity limitation among working-age adults 18–64 years of age in 2006–2007.[5]
- The 2009 *National Health Interview Survey* reported 5.9 million injuries occurred playing sports (3.8 million, or 26%, among men and 1.7 million, or 12%, among women – particularly teenagers).[6]
- The most recent *National Ambulatory Medical Care Survey* reported that family physicians provide patient education on "injury prevention" in over 4.4 million office visits.[7]

Family physicians must be prepared to evaluate a variety of musculoskeletal injuries, including sprains, cartilage and ligament tears, fractures and other traumas. When patients present with acute or chronic musculoskeletal injuries, family physicians can employ a number of examination techniques to assess such factors as range of motion, stability, bone alignment and soft tissue swelling or masses. Although the type of exam depends on the injury and area affected, some of the typical clinical indications in upper and lower extremities include: joint effusion, locking, popping or cracking; pain or stiffness upon movement; crepitation; localized tenderness; and a palpable enlarged mass and/or warmth.[8,9] The increasing burden of musculoskeletal diseases indicates a need for enhanced training in a number of areas for family physicians, such as proficiency in casting, splinting and joint injections, in order to help patients regain functioning for "everyday activities" or returning to vigorous physical activity.

Additionally, when patients present with acute or chronic musculoskeletal injuries, family physicians can employ a number of examination techniques to assess such factors as range of motion, stability, bone alignment and soft tissue swelling or masses. In the event that injured bones or soft tissue require immobilization to reduce pain, swelling and/or muscle spasms, casting or splinting is often the most appropriate form of treatment.[10,11] In some cases, patients may benefit from wrapping and taping as a form of stabilization or a prophylactic mechanism for injury prevention.[12] However, a physician should first thoroughly assess the injured area – including skin, bony structures and neurovascular status – as well as the stage and severity of the injury, potential for instability and functionality, and risk of complications. These steps should be followed to diagnose the injury before determining which mechanism is more suitable, as each has its own advantages and disadvantages.[10,12]

The AAFP Recommended Curriculum Guidelines for Family Medicine Residents indicates that family medicine residents should be able to perform the following skills related to musculoskeletal and sports medicine:[13]

- Perform an appropriate musculoskeletal history and physical examination, and formulate an appropriate diagnosis and recommend treatment, including requisite subspecialty referrals (Patient Care, Medical Knowledge, Systems-Based Practice)
- Perform an evidence-based, age-appropriate and activity-specific preparticipation physical evaluation, and provide guidance for an appropriate exercise prescription (Patient Care, Medical Knowledge, Interpersonal and Communication Skills, Professionalism)

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- Communicate effectively with a wide range of individuals regarding musculoskeletal health care, including patients, their families, coaches, school administrators and employers (Interpersonal and Communication Skills)

Including basic management of:

- Fractures (simple, stable, closed and nondisplaced that do not require surgical correction).
- Ligament sprains
    - Finger
    - Toe
    - Ankle
    - Knee
    - Vertebral column
    - Wrist
    - Elbow
    - Shoulder
- Muscular strains (e.g., hamstring, trapezius)
- Other problems
    - Costochondritis
    - Bursitis, tendinopathy, tenosynovitis
    - Common fibrocartilage injuries such as labral and meniscal tears
    - Dislocations (e.g., nursemaid's elbow)
    - Nerve entrapment syndromes
    - Baker's cyst
    - Chondromalacia patellae
    - Apophysitis (e.g., Osgood-Schlatter disease)
    - Osteochondroses/aseptic necrosis
    - Osteoarthritis/crystalline-induced arthritis (e.g., gout, pseudo-gout)
    - Metabolic bone disease (osteoporosis, Paget's disease)
    - Acute and chronic low back pain
    - Foot conditions
        - Hallux valgus (bunions)
        - Plantar fasciitis
        - Mortons neuroma
    - Osteomyelitis
    - Overuse syndromes
        - Shoulder impingement
        - Patellofemoral syndrome
    - Rheumatologic Disorders
- Procedures (indications, contraindications and complications)
    - Joint aspiration (arthrocentesis)
    - Joint injection
    - Common injections for bursitis
    - Common injections for tendinopathy
    - Strapping and taping techniques
        - Elasticized bandage
        - Ankle taping

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        - Clavicular figure-of-eight bandage
    - Splints (upper and lower extremity)
    - Plaster and fiberglass casts
        - Short and long leg, with and without walker
        - Short and long arm
        - Thumb spica
        - Cast wedging
        - Cast problems
    - Dislocation reduction
        - Simple anterior shoulder
        - Radial head
        - Simple posterior elbow
        - Phalanges
        - Patella
        - Mandible
    - Traction application (Buck's, cervical)
- Additional skills
    - Fractures
        - Closed tarsal and carpal bones, particularly navicular
        - Smith's and Colles' fractures
        - Nondisplaced medial or lateral epicondyle of humerus
        - Nondisplaced Salter-Harris Type I or Type II epiphyseal injuries in children
        - Dancer's and Jones' fractures (proximal 5th metatarsal)
    - Meniscal tears
    - Recurrent dislocations (e.g., patella, shoulder)
- Orthopedic emergency recognition and stabilization
    - Acute compartment syndrome
    - Hip dislocation
    - Knee dislocation
    - Unstable pelvis fracture
    - Cervical spine fracture
    - Spinal cord injury
    - Cauda equine syndrome
    - Neurovascular compromise
- Functional rehabilitation
    - Prescription of home exercise programs
    - Prescription of physical therapy
- Surgical Assistance

- **Casting** is the mainstay of treatment for most fractures, as they typically provide more effective immobilization.[10,11] Advantages include definitive management of simple, complex, unstable or potentially unstable fractures, as well as stabilization of severe, non-acute injuries that cannot be otherwise managed with a splint. Disadvantages include more time and skill to apply, greater risks of complications, such as heat injury, pressure sores, infection or compartment syndrome.

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- **Splints** are commonly used to reduce joint dislocations, sprains, severe soft tissue injuries and post-laceration repairs. It is usually the preferred method of immobilization in the acute care setting, particularly for soft tissue injuries. Advantages include easy application and removal to allow for routine inspection of the injury, allowance for acute swelling (which is natural during the initial phase of the injury) and the ability to prevent motion or allow functional, controlled motion. Disadvantages include the lack of patient compliance, inappropriate application (by patients and sometimes physicians), and an increased range of motion at the injured site, which can impede healing. [10,11]

- **Wrapping and taping** are commonly used by athletic trainers, however, physicians who treat non-athletic patients (such as those who participate in non-competitive activities) may benefit from a demonstration of effective wrapping and taping methods. Pre-wrap is often used as the primary layer of wrapping and is applied directly to the skin prior to being taped, although some patients may prefer to have tape applied directly to the skin – often using a quick-drying adherent. General principles of taping include being able to learn how to effectively tear tape, avoid taping wrinkles (which can lead to discomfort and the development of blisters), overlie tape strips by about one-half the tape's width, cover each area with two layers of tape and do not use excessive force when applying tape.[10-12]

Physicians may improve their care of patients with an injury requiring splinting, casting, or wrapping, by engaging in continuing medical education that provides practical integration of current evidence-based guidelines and recommendations into their standards of care, including, but not limited to the following:[10,11,14-17]

- The use of musculoskeletal ultrasonography may be considered to diagnose subtle metatarsal fractures.
- Nondisplaced or minimally displaced (less than 3 mm) fractures of the second to fifth metatarsal shafts with less than 10° of angulation can be treated conservatively with a short leg walking boot, cast shoe, or elastic bandage, with progressive weight bearing as tolerated.
- The Ottawa Ankle and Foot Rules should be used to help determine whether radiography is needed when evaluating patients with suspected fractures of the proximal fifth metatarsal.
- Early surgical management of a Jones fracture allows for an earlier return to activity than nonsurgical management and should be strongly considered for athletes or other highly active persons.
- Nondisplaced or minimally displaced (less than 2 mm) fractures of the lesser toes with less than 25% joint involvement and no angulation or rotation can be managed conservatively with buddy taping or a rigid-sole shoe.
- Finger fractures involving greater than 30 percent of the intra-articular surface should be referred to an orthopedic or hand surgeon.
- Following reduction of a proximal interphalangeal dislocation, short-term splinting in flexion with early active range of motion and strengthening is preferable to prolonged immobilization.

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- Treatment of a mallet fracture includes splinting the distal interphalangeal joint in extension; various splint types are of equal benefit.
- Displaced, oblique, or spiral finger fractures should be referred to a hand surgeon.
- Plain radiography should be the initial imaging modality to diagnose stress fractures.
- Magnetic resonance imaging is preferred over bone scintigraphy for the diagnosis of stress fractures because of greater specificity.
- Patients with tibial stress fracture may use a pneumatic compression device to reduce the time to resumption of full activity.
- Bone stimulators should not be used for the treatment of most stress fractures.
- Shock-absorbing orthotics and footwear modification may reduce the occurrence of lower extremity stress injury.
- Nonsurgical treatment of displaced intra-articular fractures of the distal radius is associated with an increased risk of radiocarpal arthritis.
- Isolated ulnar shaft fractures that are not displaced by more than 50 percent of the bone diameter and that are angulated less than 10 degrees can be treated with a functional brace or short arm cast.
- Early mobilization is favored in the treatment of Mason type I radial head fractures.
- There is no benefit of casting in the initial treatment of Mason type I radial head fractures.
- Use of a short arm radial gutter splint is recommended for initial immobilization of a displaced distal radial fracture.
- Immobilization of the thumb with a removable splint after a ligamentous injury is strongly preferred by patients, and the functional results are equal to those of plaster cast immobilization after surgical and nonsurgical treatment.
- Removable splinting is preferable to casting in the treatment of wrist buckle fractures in children.
- Splinting is the preferred method of fracture immobilization in the acute care setting.
- Casting is the mainstay of treatment for most fractures.
- Plaster should be used for most routine splinting applications. However, when weight or bulk of the cast or the time to bearing weight is important, a synthetic material chosen principally on the basis of cost is indicated.

These recommendations are provided only as assistance for physicians making clinical decisions regarding the care of their patients. As such, they cannot substitute for the individual judgment brought to each clinical situation by the patient's family physician. As with all clinical reference resources, they reflect the best understanding of the science of medicine at the time of publication, but they should be used with the clear understanding that continued research may result in new knowledge and recommendations. These recommendations are only one element in the complex process of improving the health of America. To be effective, the recommendations must be implemented. As such, physicians require continuing medical education to assist them with making decisions about specific clinical considerations.

Although some patients may require referral to specialists for enhanced treatment on some of the aforementioned conditions, having the family physician coordinate patient care is the optimal

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approach to ensure compliance with treatment, oversee medications, help patients and their families cope with a given condition and offer ongoing exams to ensure healthy behavior. As the AAFP's policy on disease management states, "Family physicians serve as the optimal care coordinator to assist patients not only with clinical care and information, but in understanding and navigating the health care system." Additionally, "Any disease management program or entity must involve the patient's family physician to maximize continuity of care."[18]

Once an appropriate method of treatment is determined and applied, it is imperative that family physicians provide clear, comprehensive instructions to patients on how to care for their injured area. Patients likely require detailed instructions and guidance on a number of factors, including: proper elevation of their injured extremity (e.g., elevating arms and legs above the heart); necessary resting and icing of the injured area; the appropriate use of non-steroidal anti-inflammatory drugs (NSAIDs); and what complications warrant immediate medical attention (e.g., numbness, tingling, loss of movement). While family physicians are likely aware of the inherent complications that may result, they must be equipped with the necessary tools to effectively communicate such information to patients.

Resources: Evidence-Based Practice Recommendations/Guidelines/Performance Measures

- Splints and casts: indications and methods[10]
- Principles of casting and splinting[11]
- Update on acute ankle sprains[12]
- Common forearm fractures in adults[14]
- Common finger fractures and dislocations[15]
- Diagnosis and Management of Common Foot Fractures[16]
- Stress fractures: diagnosis, treatment, and prevention[17]

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