Appendix 1 - AMSSM Recommended Sports Ultrasound Scanning Protocols

These scanning protocols were developed as educational/instructional tools to assist with familiarization of regional anatomy relevant to the practice of sports medicine. These protocols are not meant to be prescriptive for clinical practice. We recommend each institution develop their own clinical scanning protocols taking into consideration requirements for coding and billing and practice-specific factors.

Sports Medicine Fellows should strive to become competent in the scanning techniques and normal anatomy listed below. Recognition and reporting of pathologic findings are addressed in the AMSSM Revised Sports Ultrasound Curriculum for Sports Medicine Fellowships.

ACUTE TRAUMA

Required

1. Common sites of fracture (should also be reviewed in each of the following musculoskeletal section)
    a. Rib
    b. Clavicle
    c. Distal radius/ulna
    d. Scaphoid
    e. Metacarpal
    f. Fibula
    g. Metatarsal
2. Common sites of dislocation (should also be reviewed in each MSK section below)
    a. Glenohumeral joint
    b. Phalanx
3. eFAST (extended Focused Assessment of Sonography in Trauma)

Optional

1. Ocular trauma assessment
2. RUSH (Rapid Ultrasound in Hypotension)
3. Superficial and deep venous thrombosis
4. Pulmonary assessment
5. Limited cardiac assessment for evaluation of pericardial effusion and global systolic function

SHOULDER (to include neck, chest, and upper arm as indicated)

Required

1. Biceps tendon (long head) and muscle
2. Subscapularis tendon
3. Dynamic assessment of biceps subluxation/dislocation & subcoracoid impingement as indicated

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4. Acromioclavicular joint
5. Infraspinatus tendon and muscle
6. Teres minor tendon and muscle
7. Posterior glenohumeral joint
8. Spinoglenoid notch (suprascapular nerve and vessels)
9. Supraspinatus tendon and muscle
10. Subacromial-subdeltoid bursa
11. Coracoacromial ligament
12. Dynamic rotator cuff assessment and impingement testing

Optional (based on clinical question)

1. Pectoralis major tendon and muscle
2. Rotator Interval (including the coracohumeral ligament and superior glenohumeral ligament)
3. Clavicle
4. Sternoclavicular joint
5. Subscapularis muscle
6. Suprascapular notch (suprascapular nerve and vessels)
7. Quadrilateral space (Axillary nerve)
8. Radial nerve
9. Humerus
10. Brachial Plexus

ELBOW

Anterior elbow

Required

1. Brachialis muscle and tendon
2. Brachial artery and vein
3. Median nerve
4. Pronator teres muscle and tendon
5. Radial nerve (trace to bifurcation as indicated)
6. Brachioradialis muscle
7. Anterior humeroradial joint and recesses
8. Anterior humeroulnar joint and recesses
9. Biceps tendon and muscle

Optional (based on clinical question)

1. Bicipitoradial bursa
2. Lateral cutaneous nerve of the forearm

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Medial Elbow

Required

1. Common flexor/pronator tendon and muscles
2. Ulnar collateral ligament including dynamic valgus stress views as indicated
3. Humeroulnar joint
4. Ulnar nerve including assessment of instability with flexion/extension views

Optional (based on clinical question)

1. Dynamic assessment of posteromedial impingement and snapping triceps
2. Medial cutaneous nerve of the forearm

Lateral Elbow

Required

1. Common extensor tendon and muscles
2. Radial collateral ligament
3. Lateral humeroradial joint
4. Radial nerve from mid-arm to the bifurcation
5. Posterior interosseus nerve through supinator muscle
6. Brachioradialis
7. Extensor carpi radialis longus

Optional (based on clinical question)

1. Superficial radial nerve through forearm
2. Posterior cutaneous nerve of the forearm
3. Lateral ulnar collateral ligament
4. Annular ligament
5. Dynamic stress views of the lateral collateral ligament complex
6. Posterolateral synovial fold with dynamic assessment of impingement

Posterior Elbow

Required

1. Triceps tendon and muscles
2. Olecranon fossa and posterior joint recess
3. Olecranon process
4. Olecranon bursa
5. Ulnar nerve including assessment of instability with flexion/extension views

Optional (based on clinical question)

1. Dynamic assessment of posteromedial impingement
2. Dynamic assessment of snapping triceps

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WRIST

Volar Wrist

Required

1. Carpal tunnel including dynamic evaluation of tendon and nerve motion
2. Flexor retinaculum/Transverse carpal ligament
3. Median nerve
4. Flexor pollicis longus tendon
5. Flexor digitorum profundus and superficialis tendons
6. Palmaris longus tendon
7. Flexor carpi radialis longus tendon
8. Radial artery
9. Joints (e.g. volar radiocarpal joint) including assessment of volar ganglion cyst
10. Ulnar nerve within Guyon's canal
11. Ulnar artery
12. Flexor carpi ulnaris tendon

Optional (based on clinical question)

1. Palmar cutaneous branch of median nerve
2. Thenar motor branch/Recurrent motor branch of median nerve
3. Superficial palmar arterial arch
4. Scaphoid (assessment for fracture)
5. Hook of hamate (assessment for fracture)
6. Triangular fibrocartilage complex (meniscus homologue and triangular fibrocartilage)
7. Pisotriquetral joint
8. Dorsal ulnar cutaneous nerve

Dorsal Wrist

Required

1. Extensor tendons and muscles (6 dorsal compartments)
2. Extensor retinaculum
3. Dorsal scapholunate ligament including dynamic stress views as indicated
4. Joints as clinically indicated (radiocarpal, ulnocarpal, midcarpal, carpometacarpal) including evaluation of dorsal synovial recesses and assessment of dorsal ganglion cyst
5. Superficial radial nerve

Optional (based on clinical question)

1. Dynamic assessment of intersection syndrome at compartment 1-2 and 2-3
2. Dynamic assessment of extensor retinacular impingement
3. First dorsal compartment evaluation for presence of retinaculum (septum) and relation of neurovascular structures (superficial radial nerve branches, cephalic vein, radial artery)
4. Extensor carpi ulnaris subsheath including dynamic assessment of instability
5. Triangular fibrocartilage complex (meniscus homologue and triangular fibrocartilage)

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6. Dorsal ulnar cutaneous nerve

HAND AND FINGER

Required

1. Metacarpophalangeal and interphalangeal joints
2. Volar plates
3. Collateral ligaments
4. Flexor tendons and sheath
5. A1 and A2 pulleys
6. Extensor tendons
7. Ulnar collateral ligament of thumb MCP joint including dynamic stress views as indicated

Optional (based on clinical question)

1. Metacarpals and phalanges for fracture assessment
2. Other pulleys as indicated
3. Sagittal band injury with dynamic assessment of instability as indicated

HIP AND PELVIS

Anterior Hip

Required

1. Femoral head, neck, capsule, and anterior synovial recess
2. Hip joint assessment for effusion
3. Anterior labrum
4. Femoral vessels and nerve
5. Iliopsoas muscle, tendon and bursa
6. Sartorius and tensor fascia latae tendons and muscles
7. Rectus femoris tendon(s) and muscles
8. Dynamic scanning for snapping hip as indicated

Optional (based on clinical question)

1. Dynamic assessment of hip impingement
2. Assessment of inguinal and femoral hernia
3. Lateral cutaneous nerve of the thigh
4. Dynamic assessment for transversalis fascia tear or insufficiency (“sports hernia”)

Medial Hip

Required

1. Adductor muscles (Adductor longus/brevis/magnus and gracilis) and tendons

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2. Pubic bone and symphysis including dynamic assessment as indicated
3. Pectineus muscle
4. Distal rectus abdominis muscle and tendon
5. Rectus abdominis-adductor longus aponeurosis
6. Obturator nerve (including anterior and posterior branches)

Optional (based on clinical question)

1. Assessment of inguinal and femoral hernia
2. Dynamic assessment for transversalis fascia tear or insufficiency ("sports hernia")

Lateral Hip

Required

1. Greater trochanter of femur (including identification of anterior, lateral, posterior, and superoposterior facets)
2. Gluteus minimus tendon and muscle
3. Gluteus medius tendon and muscle (anterior and posterior bands)
4. Greater trochanteric (subgluteus maximus) bursa
5. Superficial arch at greater trochanter (Gluteus maximus muscle – iliotibial band – tensor fasciae latae muscle)
6. Dynamic scanning for snapping hip as indicated

Optional (based on clinical question)

1. Proximal iliotibial band origin at iliac crest

Posterior Hip

Required

1. Gluteus maximus muscle and insertion onto iliotibial band
2. Piriformis muscle and tendon
3. Quadratus femoris muscle
4. Proximal hamstring tendon complex (conjoint tendon and semimembranosus)
5. Proximal biceps femoris, semimembranosus, and semitendinosus muscles
6. Ischial tuberosity and bursal region
7. Sciatic nerve
8. Posterior hip joint

Optional (based on clinical question)

1. Dynamic assessment of ischiofemoral impingement
2. Posterior cutaneous nerve of the thigh

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THIGH

Anterior Thigh

Required

1. Rectus femoris muscle and tendons
2. Vastus medialis/lateralis/intermedius muscles and tendons
3. Sartorius muscle and tendon
4. Femoral nerve
5. Femur

Optional (based on clinical question)

1. Anterior cutaneous nerve of the thigh
2. Lateral cutaneous nerve of the thigh

Medial Thigh

Required

1. Adductor longus/brevis/magnus muscles and tendons
2. Gracilis muscle and tendon
3. Sartorius muscle and tendon
4. Femoral nerve
5. Obturator nerve
6. Femur

Optional (based on clinical question)

1. Saphenous nerve

Posterior Thigh

Required

1. Biceps femoris muscle and tendon
2. Semitendinosus muscle and tendon
3. Semimembranosus muscle and tendon
4. Adductor magnus muscle and tendon
5. Sciatic nerve
6. Femur

Optional (based on clinical question)

1. Posterior cutaneous nerve of the thigh

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KNEE

Anterior Knee

Required

1. Distal quadriceps muscles
2. Quadriceps tendon
3. Suprapatellar recess of knee joint
4. Patella and prepatellar bursa
5. Patellar tendon and tibial tubercle
6. Hoffa's fat pad
7. Superficial infrapatellar bursa
8. Deep infrapatellar bursa
9. Vastus medialis and medial retinaculum including the medial patellofemoral ligament and dynamic assessment of stability as indicated
10. Vastus lateralis and lateral retinaculum
11. Trochlear cartilage
12. Anterior horns of medial and lateral menisci

Optional (based on clinical question)

1. Infrapatellar branches of saphenous nerve

Medial Knee

Required

1. Medial (tibial) collateral ligament (superficial and deep portions) with valgus stress testing as indicated
2. Medial meniscus anterior and posterior horns
3. Tibiofemoral joint space
4. Pes anserine tendons and bursa
5. Medial patellar retinaculum and medial patellofemoral ligament
6. Medial patellofemoral joint

Optional (based on clinical question)

1. Saphenous nerve
2. Insertion of semimembranosus tendon

Lateral Knee

Required

1. Iliotibial band
2. Lateral synovial recess of the knee
3. Lateral meniscus anterior and posterior horns
4. Tibiofemoral joint space
5. Lateral (fibular) collateral ligament with varus stress testing as indicated

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6. Biceps femoris tendon and muscles
7. Popliteus tendon and muscle
8. Lateral patellar retinaculum
9. Lateral patellofemoral joint
10. Proximal tibiofibular joint including assessment of instability as indicated
11. Common fibular nerve at fibular tunnel

Optional (based on clinical question)

1. Division of common fibular neve into superficial and deep branches

Posterior Knee

Required

1. Popliteal artery and vein
2. Semimembranosus, semitendinosus, and biceps femoris (long and short heads) muscles and tendons
3. Medial & lateral gastrocnemius muscles and tendons
4. Evaluation for Baker's cyst at interval between semimembranosus and medial gastrocnemius
5. Sciatic, tibial, and common fibular nerves
6. Posterior horns of medial and lateral menisci
7. Posterior tibiofemoral joint
8. Posterior cruciate ligament
9. Popliteus muscle

Optional (based on clinical question)

1. Dynamic assessment of popliteal artery entrapment syndrome

LEG AND ANKLE

Anterior Leg and Ankle

Required

1. Anterior leg compartment muscles and tendons (tibialis anterior, extensor digitorum longus, extensor hallucis longus, peroneus tertius)
2. Anterior tibiotalar joint
3. Talar dome cartilage
4. Sinus tarsi
5. Anterior inferior tibiofibular ligament including dynamic assessment as indicated
6. Superficial fibular nerve at exit from crural fascia through division into medial and intermediate dorsal cutaneous nerves
7. Deep fibular nerve
8. Distal anterior tibial artery and dorsalis pedis artery

Optional (based on clinical question)

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1. Dynamic assessment of anterior impingement
2. Extensor retinaculum (superior and inferior)

Medial Leg and Ankle

Required

1. Medial gastrocnemius muscle
2. Soleus muscle
3. Flexor retinaculum
4. Deep posterior compartment muscles (tibialis posterior, flexor digitorum longus, and flexor hallucis longus)
5. Deltoid ligament
6. Medial tibiotalar joint
7. Medial aspect of posterior subtalar joint
8. Tarsal tunnel (tibial, medial plantar, and lateral plantar nerves)
9. Posterior tibial artery and veins

Optional (based on clinical question)

1. Spring ligament
2. Saphenous nerve
3. Medial calcaneal nerve
4. Inferior calcaneal (Baxter's) nerve
5. Tibia for stress fracture
6. Dynamic assessment for posteromedial impingement

Lateral Leg and Ankle

Required

1. Fibularis longus and brevis muscles and tendons
2. Superior fibular retinaculum
3. Dynamic assessment for fibular subluxation/dislocation as indicated
4. Fibular trochlea (peroneal tubercle)
5. Fibula for acute traumatic or stress fracture
6. Anterior talofibular ligament including dynamic stress views as indicated
7. Calcaneofibular ligament including dynamic stress views as indicated
8. Anterior tibiofibular ligament including dynamic stress views as indicated
9. Lateral recess of tibiotalar joint including dynamic assessment of impingement as indicated
10. Lateral recess of posterior subtalar joint
11. Sinus tarsi
12. Sural nerve and lateral calcaneal nerve

Optional (based on clinical question)

1. Anterior process of calcaneus
2. Lateral process of talus
3. Bifurcate ligament

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4. Dynamic evaluation for subfibular impingement as indicated

Posterior Leg and Ankle

Required

1. Medial and lateral gastrocnemius muscles
2. Soleus muscle
3. Achilles tendon and paratenon
4. Retrocalcaneal bursa
5. Retro-Achilles/Superficial/Subcutaneous bursa
6. Plantaris tendon
7. Posterior tibiotalar joint
8. Posterior subtalar joint

Optional (based on clinical question)

1. Posterior process of talus including identification of os trigonum if present
2. Dynamic assessment for posterior impingement
3. Deep posterior compartment leg musculature (posterior tibialis, flexor digitorum longus, flexor hallucis longus)

FOOT

Hindfoot

Required

1. Plantar fascia (central and lateral cords)
2. Plantar fat pad including dynamic assessment of compression
3. Tarsal tunnel (tibial, medial plantar, and lateral plantar nerves)
4. Sural nerve and lateral calcaneal nerve
5. Achilles tendon and paratenon
6. Plantaris tendon
7. Retro-Achilles/Superficial Achilles/Subcutaneous bursa

Optional (based on clinical question)

1. Medial calcaneal nerve
2. Inferior calcaneal (Baxter's) nerve
3. Abductor digiti minimi muscle assessment for fatty infiltration and/or atrophy (associated with inferior calcaneal (Baxter's) neuropathy)
4. Dynamic assessment for posterior impingement
5. Calcaneal stress fracture

Midfoot

Required

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1. Talonavicular joint
2. Calcaneocuboid joint
3. Tarsometatarsal joints
4. Dorsal Lisfranc ligament including dynamic assessment of stability
5. Deep fibular nerve
6. Anterior tibialis tendon insertion
7. Posterior tibialis tendon insertion
8. Spring ligament
9. Flexor digitorum longus and flexor hallucis longus at the Knot of Henry
10. Medial plantar nerve
11. Plantar fascia lateral cord insertion at 5th metatarsal base
12. Fibularis brevis insertion at 5th metatarsal base

Optional (based on clinical question)

1. Medial, intermediate, and lateral dorsal cutaneous nerves
2. Fibularis longus tendon insertion
3. Identification of tarsal coalition

Forefoot

Required

1. Metatarsophalangeal and interphalangeal joints
2. Metatarsals and phalanges for acute traumatic or stress fracture as indicated
3. Metatarsal interspace evaluation for Morton's neuroma and intermetatarsal bursitis
4. Plantar plate including dynamic assessment as indicated
5. Flexor tendons
6. Great toe sesamoids including dynamic assessment as indicated

Optional (based on clinical question)

1. Extensor tendon insertions
2. Medial plantar proper digital nerve (plantarmedial hallucal nerve)

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