

Orthopaedic Surgery Milestones

PETER J. STERN, MD
 STEPHEN ALBANESE, MD
 MATHIAS BOSTROM, MD
 CHARLES S. DAY, MD, MBA
 STEVEN L. FRICK, MD
 WILLIAM HOPKINSON, MD
 SHEPARD HURWITZ, MD
 KEITH KENTER, MD
 JOHN S. KIRKPATRICK, MD
 J. L. MARSH, MD
 ANAND M. MURTHI, MD
 LISA A. TAITSMAN, MD, MPH
 BRIAN C. TOOLAN, MD
 KRISTY WEBER, MD
 RICK W. WRIGHT, MD
 PAMELA L. DERSTINE, PhD, MHPE
 LAURA EDGAR, EdD, CAE

Peter J. Stern, MD, is Norman S. & Elizabeth C.A. Hill Professor and Chairman of Orthopaedic Surgery at the University of Cincinnati College of Medicine; **Stephen Albanese, MD**, is Professor and Chair of Orthopedic Surgery and Medical Director of Orthopedic Surgery Clinic at SUNY Upstate Medical University; **Mathias Bostrom, MD**, is Residency Program Director and Academic Director of Orthopaedics at Hospital for Special Surgery and Professor of Orthopaedic Surgery, Weill Cornell Medical College, Helen Hayes Hospital; **Charles S. Day, MD, MBA**, is Rabkin Fellow in Medical Education, Associate Professor of Orthopedic Surgery at Harvard Medical School, and Chief/Program Director of Hand and Upper Extremity Surgery at Beth Israel Deaconess Medical Center; **Steven L. Frick, MD**, is Chairman of Orthopedic Surgery at Nemours Children's Hospital and Professor of Orthopedic Surgery at the University of Central Florida College of Medicine; **William Hopkinson, MD**, is Professor, Vice-Chair, and Program Director of Orthopaedic Surgery & Rehabilitation at Loyola University Stritch School of Medicine; **Shepard Hurwitz, MD**, is Executive Director of the American Board of Orthopaedic Surgery and Professor of Orthopaedics at the University of North Carolina; **Keith Kenter, MD**, is Director of the Orthopaedic Surgery Residency Program, Associate Professor of Orthopaedic Surgery, and Associate Professor of Physical Medicine and Rehabilitation at the University of Cincinnati College of Medicine; **John S. Kirkpatrick, MD**, is Professor and Chair of Orthopaedic Surgery and Rehabilitation and Program Director of Orthopaedic Surgery Residency at the University of Florida College of Medicine; **J. L. Marsh, MD**, is Program Director of Residency Training Program and Professor and Carroll B. Larson Chair of Orthopaedics and Rehabilitation at the University of Iowa; **Anand M. Murthi, MD**, is Chief of Shoulder and Elbow Surgery and Fellowship Director at MedStar Union Memorial Hospital; **Lisa A. Taitsman, MD, MPH**, is Associate Professor of Orthopaedics and Sports Medicine at the University of Washington; **Brian C. Toolan, MD**, is Associate Professor of Surgery and Director of the Residency Program of Orthopaedic Surgery at the University of Chicago Medicine; **Kristy Weber, MD**, is Virginia & William Percy Professor of Orthopaedic Surgery, Division Chief of Orthopaedic Oncology, and Director of the Sarcoma Center at Johns Hopkins School of Medicine; **Rick W. Wright, MD**, is Dr Asa C. Dorothy W. Jones Professor of Orthopaedic Surgery, Residency Program Director, and Co-Chief of Sports Medicine at Washington University School of Medicine; **Pamela L. Derstine, PhD, MHPE**, is Executive Director of the Review Committees for Colon and Rectal Surgery, Neurological Surgery, Orthopaedic Surgery, and Otolaryngology at the Accreditation Council for Graduate Medical Education; and **Laura Edgar, EdD, CAE**, is Senior Associate Director of Outcome Assessment at the Accreditation Council for Graduate Medical Education.

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The Milestones are designed only for use in evaluation of resident physicians in the context of their participation in Accreditation Council for Graduate Medical Education–accredited residency or fellowship programs. The Milestones provide a framework for the assessment of the development of the resident physician in key dimensions of the elements of physician competency in a specialty or subspecialty. They neither represent the entirety of the dimensions of the 6 domains of physician competency nor are they designed to be relevant in any other context.

Corresponding author: Laura Edgar, EdD, CAE, Senior Associate Director, Outcome Assessment, Accreditation Council for Graduate Medical Education, 515 N State St, Ste 2000, Chicago, IL 60654, 312.755.5089, ledgar@acgme.org

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TABLE 1 ANTERIOR CRUCIATE LIGAMENT (ACL)—MEDICAL KNOWLEDGE

Level 1	Level 2	Level 3	Level 4	Level 5
- Demonstrates knowledge of pathophysiology related to ACL injury (eg, mechanisms of injury) - Correlates anatomic knowledge to imaging findings on basic imaging studies - Has knowledge of natural history of ACL injury - Demonstrates knowledge of ACL injury anatomy and basic surgical approaches (eg, ACL bundles)	- Understands pathophysiology of concomitant injuries (eg, secondary restraints of knee [PL corner]) - Correlates anatomic knowledge to imaging findings on advanced imaging studies - Ability to grade instability (eg, translations grade and end point) - Understands the effects of intervention on natural history of ACL injury - Understands alternative surgical approaches (eg, miniopen, 2 incision) - Understands basic pre-surgical planning and templating - Understands advantages and disadvantages of graft types	- Demonstrates knowledge of current literature and alternative treatments - Understands rehabilitation mechanics (eg, phases of rehabilitation, closed versus open chain exercises) - Understands biomechanics of the knee and biomechanics of implant choices	- Understands controversies within the field (eg, graft type, brace treatment, surgical technique and fixation, surgical techniques to include skeletally immature knee) - Applies understanding of natural history to clinical decision-making - Understands how to prevent/avoid potential complications	Primary author/presenter of original work within the field

TABLE 2 ANTERIOR CRUCIATE LIGAMENT (ACL)—PATIENT CARE

Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and performs basic physical exam (eg, age, gender, history of present illness [HPI], past medical history [PMHx], social history, range of motion, effusion, neurovascular status) - Appropriately orders basic imaging studies (eg, knee radiographs) - Prescribes nonoperative treatments (eg, range of motion [ROM], weight-bearing [WB] status) - Provides basic perioperative management (eg, neurovascular status, brace, WB status) - Lists potential complications (eg, infection, loss of motion, graft failure, neurovascular compromise)	- Obtains focused history and performs focused exam (eg, mechanism of injury, past knee history, past treatments, Lachman, anterior drawer, pivot shift, meniscal pain) - Appropriately interprets basic imaging studies (eg, alignment, joint space, patella alignment) - Prescribes and manages nonoperative treatment (eg, closed chain quad strengthening) - Completes preoperative planning with instrumentation, graft selection and implants - Examines injury under anesthesia (eg, complete ligament examination) - Provides postoperative management and rehabilitation (eg, WB status, brace, ROM, quad strength) - Capable of diagnosis and early management of complications (eg, graft failure, tunnel placement)	- Recognizes concomitant associated injuries (eg, lateral collateral ligament [LCL], multi ligament, osteochondritis dissecans [OCD], posterior cruciate ligament [PCL], collateral ligaments, posterolateral corner instability, reverse pivot shift) - Appropriately orders and interprets advanced imaging studies (eg, standing views, magnetic resonance imaging [MRI], Segond fracture, bone bruising) - Provides complex nonoperative treatment (eg, WB status, bracing as appropriate, vascular studies) - Completes comprehensive preoperative planning with alternatives - Performs diagnostic arthroscopy, notchplasty, and/or Graft harvest - Modifies and adjusts postoperative treatment plan as needed (eg, loss of knee motion treatment, sport-specific drills, return to sport)	- Performs graft passage and fixation - Capable of treating complications both intraoperatively and postoperatively (eg, graft harvest failure, tunnel malposition, chondral injury)	- Performs revision/transphysseal ACL reconstruction (eg, hardware removal, outside in drilling techniques) - Develops unique, complex postoperative management plans - Surgically treats complex complications

ANKLE ARTHRITIS—MEDICAL KNOWLEDGE				
Level 1	Level 2	Level 3	Level 4	Level 5
• Demonstrates knowledge of pathophysiology related to ankle/midfoot/hindfoot arthritis • Correlates anatomic knowledge to imaging findings on basic imaging studies (eg, osteophyte formation, joint narrowing, subchondral cysts, and sclerosis) • Demonstrates basic knowledge of natural history of ankle/midfoot/hindfoot arthritis • Demonstrates knowledge of gait mechanics (eg, phases of gait) and normal limb alignment • Demonstrates knowledge of ankle/midfoot/hindfoot arthritis anatomy and basic surgical approaches (eg, anterior, lateral-transfibular) • Demonstrates knowledge of nonoperative treatment options and surgical indications	• Correlates anatomic knowledge to imaging findings on advanced imaging studies (eg, bone loss, articular deformity, subluxation) • Understands the effects of intervention on natural history of ankle/midfoot/hindfoot arthritis (eg, effects of nonsteroidal anti-inflammatory, steroid injections, brace, rocker bottom shoes) • Demonstrates knowledge of abnormal gait mechanics of ankle/midfoot/hindfoot arthritis (eg, antalgic gait, circumduction, decreased stance) and abnormal limb alignment and adjacent joint function • Understands alternative surgical approaches (eg, posterior, posterolateral, posteromedial) • Understands basic presurgical planning and templating • Understands nonoperative treatment options and surgical indications	• Demonstrates knowledge of current literature and alternative treatments (eg, nonoperative, cheilectomy, fusion, replacement, distraction) • Understands abnormal gait mechanics of ankle/midfoot/hindfoot arthritis (eg, identifies abnormal gait patterns in patient) • Applies general understanding of nonoperative treatment options and surgical indications	• Understands controversies within the field • Applies understanding of natural history to clinical decision-making (eg, considers patient-specific characteristics of disease to select most appropriate treatment) • Applies biomechanics to implant and procedure selection	• Primary author/presenter of original work within the field

ANKLE ARTHRITIS—PATIENT CARE				
Level 1	Level 2	Level 3	Level 4	Level 5
• Obtains history and performs basic physical exam • Appropriately orders basic imaging studies (eg, three weight-bearing views) • Prescribes nonoperative treatments • Provides basic perioperative management (eg, preoperative and postoperative orders, laboratory tests, consults) • Lists potential complications	• Obtains focused history and performs focused exam and gait analysis • Appropriately interprets basic imaging studies • Prescribes and manages nonoperative treatment (eg, nonsteroidal anti-inflammatory drugs [NSAIDs], steroid injections, brace, rocker bottom shoes) • Completes preoperative planning with instrumentation and implants • Performs one basic surgical approach to the ankle/midfoot/hindfoot arthritis (eg, anterior or lateral transfibular) • Provides postoperative management and rehabilitation (eg, prothrombin time [PT] orders with goals and restrictions) • Capable of diagnosis and early management of complications (eg, wound healing problems, infection, deep vein thrombosis [DVT])	• Appropriately orders and interprets advanced imaging studies/laboratory studies • Completes comprehensive preoperative planning with alternatives • Modifies and adjusts postoperative treatment plan as needed	• Provides patient specific nonoperative treatment (eg, diagnostic injections) • Capable of performing straight forward ankle/midfoot/hindfoot reconstruction such as Tarsometatarsal joint arthrodesis, tarsal joint arthrodesis, triple, talonavicular or subtalar joint arthrodesis and ankle fusion (eg, with minimal deformity or bone defect) • Capable of surgically treating simple complications (eg, incision and drainage [I&D])	• Performs complex surgical approaches and reconstruction to the ankle/midfoot/hindfoot arthritis (eg, posterior, posterolateral, posteromedial) • Develops unique, complex postoperative management plans • Surgically treats complex complications (eg, nonunion, malunion)

TABLE 5 ANKLE FRACTURE—MEDICAL KNOWLEDGE

Level 1	Level 2	Level 3	Level 4	Level 5
- Demonstrates knowledge of pathophysiology related to ankle fractures - Correlates anatomic knowledge to imaging findings on basic imaging studies - Demonstrates knowledge of nonoperative treatment options and surgical indications	- Demonstrates ability to describe and classify fractures - Correlates anatomic knowledge to imaging findings on advanced imaging studies - Demonstrates basic knowledge of natural history of ankle fractures - Demonstrates knowledge of the anatomy of ankle fractures and basic surgical approaches - Understands basic presurgical planning and templating - Understands implication of open fractures and soft tissue injury	- Demonstrates knowledge of current literature and alternative treatments - Understands the effects of intervention on natural history of ankle fractures - Understands alternative surgical approaches	- Understands controversies within the field (eg, syndesmotic fixation, indications and options) - Applies understanding of natural history to clinical decision-making - Understanding of biomechanics and implant choices	Primary author/presenter of original work within the field

TABLE 6 ANKLE FRACTURE—PATIENT CARE

Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and performs basic physical exam - Appropriately orders basic imaging studies - Prescribes nonoperative treatments - Splints fracture appropriately - Provides basic perioperative management - Lists potential complications	- Obtains focused history and performs focused exam; recognizes implications of soft tissue injury - Appropriately interprets basic imaging studies - Prescribes and manages nonoperative treatment - Performs a closed reduction - Completes preoperative planning with instrumentation and implants - Performs surgical exposure of the lateral malleolus - Provides postoperative management and rehabilitation - Capable of diagnosis and early management of complications	- Appropriately orders and interprets advanced imaging studies (eg, stress views, computed tomography [CT] scan) - Provides a comprehensive assessment of most fractures on imaging studies - Completes comprehensive preoperative planning with alternatives - Performs surgical reduction and fixation of a simple fracture (eg, lateral or bimalleolar ankle fracture) - Modifies and adjusts postoperative treatment plan as needed - Capable of treating complications both intraoperatively and postoperatively (eg, wound breakdown following malleolar fixation)	- Provides comprehensive assessment of complex fracture patterns on imaging studies (eg, pilon fracture) - Recognizes indications for and provides nonoperative treatment of an unstable fracture (eg, diabetes, medical comorbidities, noncompliance) - Performs surgical reduction and fixation of a moderately complex fracture (eg, open reduction internal fixation [ORIF] trimalleolar ankle fracture or simple pilon fracture)	- Performs surgical reduction and fixation of a full range of fractures and dislocations (eg, ORIF complex pilon fracture) - Develops unique, complex postoperative management plans - Surgically treats complex complications (eg, revision fixation after failed ORIF)

CARPAL TUNNEL—MEDICAL KNOWLEDGE					
TABLE 7					
Level 1	Level 2	Level 3	Level 4	Level 5	
- Understands the anatomy of carpal tunnel/median nerve [MN] - Understands the normal physiology of the MN	- Demonstrates knowledge of the differential diagnosis of neuropathic surgery (eg, pronator syndrome, cubital tunnel syndrome, thoracic outlet syndrome, cervical radiculopathy, peripheral neuropathy) - Understands risk factors associated with carpal tunnel syndrome (CTS) (eg, diabetes, inflammatory arthritis, pregnancy, hypothyroidism) - Demonstrates knowledge of MN motor/sensory distribution, thumb abduction, thenar numbness, anterior interosseous nerve (AIN) weakness, cervical radiculopathy - Understands natural history of CTS - Understands the pathophysiology of nerve compression (eg, increased carpal tunnel pressure, nerve ischemia) - Understands surgical options (eg, open, endoscopic)	- Demonstrates knowledge of current literature and alternatives to surgery - Understands the capabilities and limitations of electrodiagnostic studies - Understands influence of comorbidities - Demonstrates knowledge of surgical complications of surgical management (eg, location of MN with respect to superficial arch, recurrent motor branch, palmar cutaneous branch, Guyon canal)	Understands controversies within field (eg, endoscopic versus open, use of electrodiagnostics)	Primary author/presenter of original work within the field	

CARPAL TUNNEL—PATIENT CARE					
TABLE 8					
Level 1	Level 2	Level 3	Level 4	Level 5	
- Obtains basic history and performs basic physical exam - Lists potential surgical complications (eg, infection, scar sensitivity, neurovascular injury)	- Obtains focused history, including identifying night pain, paresthesias - Performs median nerve (MN) motor/ sensory evaluation (eg, MN numbness, thumb abduction) - Performs provocative maneuvers (eg, Tinel, Phalen, MN compression test) - Appropriately considers electrodiagnostic test - Prescribes non-operative treatments (eg, night splints, steroid injection when appropriate) - Capable of diagnosing surgical complications (eg, injury to the MN or its branches and vascular injury) - Provides simple post-operative management and rehabilitation	- Evaluates other sites of MN compression (eg, pronator syndrome, cervical radiculopathy) - Interprets electrodiagnostic tests	- Performs carpal tunnel release (CTR) (eg, open or endoscopic) - Capable of treating simple complications (eg, infection, wound healing) - Capable of performing complex postoperative management (eg, worsening numbness, worsening pain, additional radiating symptoms)	- Capable of surgical management of major complications (eg, injury to superficial arch, ulnar artery, branches of MN, or MN) - Capable of opposition transfer (eg, palmaris longus, extensor indicis pollicis [EIP], or flexor digitorum superficialis [FDS]) - Capable of performing revision carpal tunnel surgery	

TABLE 9 DEGENERATIVE SPINAL CONDITIONS—MEDICAL KNOWLEDGE

Level 1	Level 2	Level 3	Level 4	Level 5
- Demonstrates knowledge of pathophysiology related to lumbar and cervical degenerative conditions - Correlates anatomic knowledge to imaging findings on basic imaging studies (eg, cervical or lumbar radiographs) - Demonstrates knowledge of physical exam of cervical and lumbar spine and related neurological and provocative signs - Demonstrates knowledge of general perioperative patient care	- Describes specific clinical syndromes of lumbar and cervical degenerative conditions (eg, radiculopathy from herniated nucleus pulposus [HNP] versus stenosis versus spondylolisthesis, back pain, cervical radiculopathy, or myelopathy) - Correlates anatomic knowledge to imaging findings on advanced imaging studies (eg, magnetic resonance imaging [MRI], myelogram/CT) - Demonstrates knowledge of biological theories of pain generation - Demonstrates knowledge of natural history of lumbar and cervical degenerative conditions - Demonstrates knowledge of anatomic changes resulting from lumbar and cervical degenerative disorders and basic surgical approaches (eg, anterior cervical, posterior cervical or lumbar) - Demonstrates knowledge of basic presurgical planning and criteria for acceptable intraoperative result for simple primary cases (eg, laminotomy for herniated nucleus pulposus [HNP], single-level anterior cervical discectomy and fusion [ACDF]) - Demonstrates knowledge of nonoperative treatment options	- Demonstrates knowledge of current literature and alternative treatments - Demonstrates knowledge of biology of fusion healing - Demonstrates knowledge of the effects of intervention on natural history of lumbar and cervical degenerative conditions - Demonstrates knowledge of alternative surgical approaches, complications of approaches - Demonstrates knowledge of presurgical planning and criteria for acceptable intraoperative result for cases of moderate complexity (eg, spondylolisthesis, multilevel decompression and fusion) - Demonstrates knowledge of surgical indications - Demonstrates knowledge of basic implant choices	- Demonstrates knowledge of controversies within the field (eg, epidural blocks, arthroplasty versus fusion, and fusion techniques) - Demonstrates knowledge of cervical and lumbar biomechanics and alterations by decompression or implants - Demonstrates knowledge of influence of natural history and comorbidity on clinical decision-making - Demonstrates knowledge of alternative implant choices/biomaterials	Primary author/presenter of original work within the field

TABLE 10 DEGENERATIVE SPINAL CONDITIONS—PATIENT CARE

Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and performs basic physical exam - Appropriately orders basic imaging studies - Prescribes nonoperative treatments: nonsteroidal anti-inflammatory drugs (NSAIDs), rehabilitation, initiates basic care - Recognizes indications for and initiates immediate additional surgical care (progressive deficit, cauda equina syndrome) - Provides basic/general perioperative management - Lists potential complications	- Obtains focused history and performs focused exam; appropriately interprets neurological exam - Appropriately interprets basic imaging studies - Assists in exposure for anterior and posterior cervical spine, posterior lumbar spine, performs closure - Provides procedure and patient specific postoperative management and rehabilitation - Capable of diagnosis and early management of complications	- Extends examination to nonspinal differential diagnostic possibilities (vascular claudication, hip arthritis, etc) - Appropriately orders and interprets advanced imaging studies (MRI, myelogram, CT); correlates clinical and imaging findings to form clinical diagnosis - Prescribes and manages nonoperative treatment: injections, referrals to other professionals - Recommends appropriate surgical procedures considering indications and contraindications, risks and benefits for simple cases (eg, single-level HNP with radiculopathy) - Completes comprehensive preoperative planning with alternatives and criteria for acceptable intraoperative result for straightforward cases (single-level HNP) - Capable of performing anterior and posterior cervical, posterior lumbar surgical exposure, assisting with implant placement - Modifies and adjusts postoperative treatment plan according to clinical situation (eg, modifies for comorbid conditions or complications) - Capable of treating simple complications both intraoperatively and postoperatively (eg, medical complications, hemostasis)	- Provides complex nonoperative treatment (eg, individualized care, shared decision making, comprehensive informed consent) - Recommends appropriate surgical procedures considering indications and contraindications, risks and benefits for complex cases (eg, multilevel stenosis with deformity) - Completes comprehensive preoperative planning with alternatives and criteria for acceptable intraoperative result for complex cases (eg, multilevel stenosis with deformity) - Capable of decontouring for posterolateral fusion, placing grafts - Capable of surgically treating simple complications (eg, drainage of hematoma, debridement of infection)	- Completes comprehensive preoperative planning with alternatives and criteria for acceptable intraoperative result for highly complex cases (eg, revision surgery) - Capable of performing decompression, posterior lumbar interbody fusion (PLIF), transforaminal lumbar interbody fusion (TLIF), places complex implants (eg, fusion cages, pedicle screws) - Develops unique complex postoperative management plans when indicated - Capable of surgical treatment of complex complications (eg, revise displaced hardware or graft, durotomy repair)

DIABETIC FOOT—MEDICAL KNOWLEDGE					
TABLE 11					
Level 1	Level 2	Level 3	Level 4	Level 5	
- Demonstrates knowledge of pathophysiology related to diabetes mellitus (eg, neuropathy, retinopathy, renal disease, peripheral vascular disease) - Knowledge of medical management of diabetes mellitus (eg, glycemic control, diabetic diet) - Demonstrates some knowledge of natural history of diabetes mellitus - Demonstrates knowledge of foot anatomy	- Understands diabetic foot conditions and staging systems (eg, infection vs. Charcot, Eichenholz classification) - Correlates anatomic knowledge to imaging findings on basic imaging studies (eg, x-ray signs of osteomyelitis, Charcot changes) - Demonstrates some knowledge of diabetic foot conditions (neuropathic ulcer risk factors) and the effects of intervention (eg, off-loading and immobilization for Charcot, debridement, and antibiotics for infection) - Demonstrates some knowledge of gait mechanics (eg, phases of gait and normal limb alignment) - Demonstrates knowledge of basic surgical approaches (eg, dorsomedial and dorsolateral approaches, amputations of the foot) - Understands basic presurgical planning - Demonstrates knowledge of nonoperative treatment options and surgical indications - Understands basic science of wound healing	- Demonstrates knowledge of current literature and alternative treatments (eg, debridement, off-loading, immobilization) - Correlates anatomic knowledge to imaging findings on advanced imaging studies (eg, CT and MRI signs of osteomyelitis) - Demonstrates some knowledge of abnormal gait mechanics and limb alignment and adjacent joint function, diabetic shoe wear and orthotics (eg, appropulsive gait, antalgic gait, and loss of proprioception and balance)	- Understands controversies within the field (eg, nonoperative vs. operative management of osteomyelitis) - Applies understanding of natural history to patient-specific clinical decision-making - Understands alternative surgical approaches (eg, Plantar approach, complex amputations of the foot)	Primary author/presenter of original work within the field	

DIABETIC FOOT—PATIENT CARE					
TABLE 12					
Level 1	Level 2	Level 3	Level 4	Level 5	
- Obtains history and performs basic physical exam - Appropriately orders basic imaging studies (eg, 3 or 4 weight-bearing views of the foot) - Provides basic perioperative management (eg, preoperative and postoperative orders, laboratory tests, consults) - Lists potential complications	- Obtains focused history and performs focused exam - Appropriately interprets basic imaging studies - Prescribes and manages nonoperative treatment (eg, wound care, antibiotics, off-loading, immobilization, depth shoes, accommodative orthotics) - Completes preoperative planning including vascular assessment and the potential for wound healing (eg, ankle-brachial indices [ABIs] endovascular consultation) - Performs one basic surgical approach to the diabetic foot (eg, medial or lateral) - Provides postoperative management and rehabilitation (PT orders with goals and restrictions) - Capable of diagnosis and early management of complications (eg, wound healing problems, infection, DVT)	- Appropriately orders and interprets advanced imaging studies (eg, CT and MRI with or without contrast) - Completes comprehensive preoperative planning with alternatives for limb salvage (eg, revascularization combined with reconstruction) - Modifies and adjusts postoperative treatment plan as needed	- Provides complex nonoperative treatment (eg, multiple comorbidities, noncompliant, etc) - Capable of performing alternative surgical approaches to the diabetic foot (eg, multiple or plantar approaches) - Capable of treating complications, both intraoperative and postoperatively	- Develops unique, complex postoperative management plans - Surgically treats complex complications	

TABLE 1.3 DIAPHYSEAL FEMUR AND TIBIA FRACTURE—MEDICAL KNOWLEDGE

Level 1	Level 2	Level 3	Level 4	Level 5
- Demonstrates knowledge of pathophysiology related to diaphyseal femur and tibia fractures - Correlates anatomic knowledge to imaging findings on basic imaging studies - Demonstrates knowledge of medical and surgical comorbidities	- Able to describe and classify fractures - Correlates anatomic knowledge to imaging findings on advanced imaging studies - Demonstrates knowledge of associated injuries and effect on surgical care (eg, femoral neck fracture, associated skeletal injuries) - Understands implication of open fractures and soft tissue injury - Demonstrates knowledge of bone biology, osteoporosis, and bone health management - Demonstrates knowledge of natural history of diaphyseal femur and tibia fractures - Demonstrates knowledge of anatomy of diaphyseal femur and tibia fractures and basic surgical approaches - Understands basic presurgical planning and templating - Demonstrates knowledge of nonoperative treatment options and surgical indications - Demonstrates knowledge of surgical and nonoperative complications (eg, compartment syndrome, fat emboli, infection)	- Demonstrates knowledge of current literature and alternative treatments - Demonstrates knowledge of the effect of polytrauma on management of diaphyseal femur and tibia fractures - Understands biomechanics and implant choices - Understands the effects of intervention on natural history of diaphyseal femur and tibia fractures - Understands alternative surgical approaches - Recognizes surgical indications in complex fractures and patients with polytrauma	- Understands controversies within the field (eg, initial management of femur fracture in patient with polytrauma) - Applies understanding of natural history to clinical decision-making	Primary author/presenter of original work within the field

TABLE 1.4 DIAPHYSEAL FEMUR AND TIBIA FRACTURE—PATIENT CARE

Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and performs basic physical exam - Appropriately orders basic imaging studies - Splints fracture appropriately - Provides basic management perioperative - Assesses for limb perfusion and compartment syndrome - Lists potential complications	- Obtains focused history and performs focused exam - Appropriately interprets basic imaging studies - Prescribes and manages nonoperative treatment - Performs a closed reduction - Completes preoperative planning with instrumentation and implants - Performs basic surgical approaches - Performs patient positioning for operative fixation (eg, use of fracture table) - Provides postoperative management and rehabilitation - Performs basic open-wound management and debridement - Initiates management of limb reperfusion and compartment syndrome - Recognizes the needs of the patient with polytrauma - Capable of diagnosis and early management of complications	- Appropriately orders and interprets advanced imaging studies - Provides complex, nonoperative treatment - Completes comprehensive preoperative planning with alternatives - Performs surgical repair to a simple fracture - Effectively uses intraoperative imaging - Modifies and adjusts postoperative treatment plan as needed - Capable of performing compartment release	- Performs surgical repair to a moderately complex fracture (eg, able to perform intramedullary nailing of segmental femur fracture) - Performs alternative surgical approaches for femur and tibia fractures (eg, open reduction techniques) - Performs complex wound management and debridement (eg, understands need for consultation for flap coverage) - Prioritizes the needs of the patient with polytrauma (eg, timing of long-bone fixation, works with consulting teams) - Capable of treating complications both intraoperatively and postoperatively (eg, manages postoperative infection)	- Performs surgical repair to a complex fracture (eg, able to perform intramedullary nail nailing of distal tibia fracture with intra-articular extension) - Develops unique, complex postoperative management plans - Surgically treats complex complications (eg, treats femoral neck fracture identified after femoral nailing)

TABLE 15 DISTAL RADIUS FRACTURE (DRF)—MEDICAL KNOWLEDGE				
Level 1	Level 2	Level 3	Level 4	Level 5
- Demonstrates knowledge of anatomy - Understands basic imaging	- Demonstrates knowledge of fracture description and soft tissue injury: angulation, displacement, shortening, comminution, shear pattern, articular parts - Understands mechanism of injury - Understands biology of fracture healing - Understands advanced imaging - Understands surgical approaches and fixation techniques: percutaneous pinning, volar plating, external fixation, dorsal plating, fragment-specific, combinations	- Demonstrates knowledge of current literature, fracture classifications, and therapeutic alternatives - Demonstrates knowledge of associated injuries: median nerve injury, scaphoid fracture; scapholunate (SL) ligament injury, triangular fibrocartilage complex (TFCC) injury, elbow injuries - Understands natural history of distal radius fracture - Understands biomechanics and implant choices: understands the advantage and disadvantages of different fixation techniques	Understands controversies within the field: fixation techniques and fracture patterns, correlation between radiographic and functional outcomes in elderly patient	Participates in research in the field with publication

TABLE 16 DISTAL RADIUS FRACTURE (DRF)—PATIENT CARE				
Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and performs basic physical exam - Orders/interprets basic imaging studies - Splints fracture appropriately - Provides basic postoperative management and rehabilitation - Lists potential complications (eg, infections, hardware failure tendon injury, complex regional pain syndrome [CRPS], carpal tunnel syndrome, malreduction)	- Obtains focused history and physical, recognizes implications of soft tissue injury (eg, open fracture, median nerve dysfunction, distal radioulnar joint [DRUJ] instability) - Orders/interprets advanced imaging (eg, CT for comminuted articular fractures) - Recognizes stable/unstable fractures (eg, metaphyseal comminution, volar/dorsal Barton fracture, die-punch pattern, multiple articular parts) - Able to perform a closed reduction and splint appropriately - Recognizes surgical indications (eg, median nerve dysfunction, instability, articular step off/gap, dorsal angulation, radius shortening) - Performs surgical exposure - Modifies and adjusts postoperative plan when indicated - Recognizes/evaluates fragility fractures (eg, orders appropriate workup and/or consult) - Diagnoses and provides early management of complications	- Performs preoperative planning with appropriate instrumentation and implants - Capable of surgical reduction and fixation of extra-articular fracture - Interprets diagnostic studies for fragility fractures with appropriate management and/or referral	- Capable of surgical reduction and fixation of simple intraarticular fractures (eg, no more than two articular fragments) - Capable of surgically treating simple complications (eg, infections, open carpal tunnel release)	- Capable of surgical reduction and fixation of a full range of fractures and dislocations (eg, comminuted or very distal articular fractures, dorsal and volar metaphyseal fractures, greater arc perilunate injuries, scapholunate ligament injuries) - Capable of surgically treating complex complications (eg, osteotomies, revision fixation)

TABLE 17 ADULT ELBOW FRACTURE—MEDICAL KNOWLEDGE

Level 1	Level 2	Level 3	Level 4	Level 5
- Demonstrates knowledge of fractures (eg, olecranon, radial head, coronoid fracture, terrible triad fracture, distal humerus fracture, fracture dislocation) - Demonstrates knowledge of anatomy (eg, elbow joint, radial head, coronoid, olecranon, distal humerus, elbow ligaments) - Understands basic imaging studies	- Understands mechanism of injury and knowledge of fracture classification and soft tissue injury (eg, olecranon, radial head, coronoid fracture, terrible triad fracture, distal humerus fracture, fracture dislocation) - Demonstrates knowledge of imaging studies/laboratory studies (eg, radiographs anteroposterior [AP]/lateral/oblique/axial) - Understands surgical approaches (eg, soft tissue envelope, cutaneous nerves, ulnar nerve treatment) - Understands biology of fracture healing - Understands advanced imaging studies (eg, postoperative x-rays, CT scans for fracture healing)	- Demonstrates knowledge of current literature and alternatives (eg, fracture repair versus replacement, postoperative stiffness concepts) - Understands rehabilitation mechanics (eg, range of motion therapy, dynamic/static stretch splinting) - Understands biomechanics and implant choices (eg, radial head replacement, compression headless screws, elbow replacement types)	- Understands controversies within field (eg, tension band versus plating olecranon fractures, elbow replacement for elderly distal humerus fractures; radial head repair versus replacement) - Understands how to avoid/prevent potential complications - Demonstrates knowledge of pathophysiology of elbow stiffness (eg, intrinsic, extrinsic, hardware placement) - Understands postoperative imaging studies/implant positioning	Participates in research in the field with publication

TABLE 18 ADULT ELBOW FRACTURE—PATIENT CARE

Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and basic physical (eg, age, gender, mechanism of injury, deformity, skin integrity, open/closed injury) - Splints fracture appropriately - Provides basic perioperative management (eg, postoperative orders, ice, elevation, compression) - Lists potential complications (eg, infection, hardware failure, stiffness, reflex sympathetic dystrophy [RSD], neurovascular injury, posttraumatic arthritis)	- Obtains focused history and physical, recognizes implications of soft tissue injury (eg, open fracture, compartment syndrome, ligamentous injury) - Able to order appropriate imaging studies (eg, radiographs, CT scan/3D reconstruction) - Performs basic surgical approach to elbow fractures - Reduces fracture if necessary (eg, provisional fixation, fluoroscopic checks) - Recognizes surgical indications (eg, fracture displacement, elbow instability, transolecranon injury) - Provides postoperative management and rehabilitation (eg, splinting and ROM therapy) - Capable of diagnosis and early management of complications (eg, diagnosis from perioperative x-rays, recognizes infection, recognizes fracture displacement/dislocation)	- Performs preoperative planning with instrumentation and implants (eg, patient positioning, plates/screws, fluoroscopy) - Capable of surgical reduction and fixation of a simple fracture (eg, olecranon fracture) - Provides postoperative management and rehabilitation (eg, increased ROM as healing progresses, adequate/proper postoperative x-rays)	- Performs comprehensive preoperative planning/alternatives (eg, use of external fixation, radial head replacement, elbow arthroplasty) - Capable of surgical reduction and fixation of moderately complex fractures (extra-articular and simple intraarticular distal humerus fracture) - Modifies and adjusts postoperative plan as needed (eg, dynamic/static stretch splinting, revise therapy) - Treats simple complications both intraoperatively and postoperatively (eg, revise hardware placement, recognizes improper hardware position)	- Capable of surgical reduction and fixation of a full range of fractures and dislocations - Understands how to avoid/prevent potential complications - Surgically treats complex complications (eg, elbow release for stiffness, identifies infection, revision hardware failure, nonunion treatment)

TABLE 19 HIP AND KNEE OSTEOARTHRITIS (OA)—MEDICAL KNOWLEDGE

Level 1	Level 2	Level 3	Level 4	Level 5
- Demonstrates knowledge of pathophysiology related to hip and knee arthritis - Correlates anatomic knowledge to imaging findings on basic imaging studies - Demonstrates some knowledge of natural history of hip and knee arthritis - Demonstrates knowledge of hip and knee arthritis anatomy and basic surgical approaches - Demonstrates knowledge of nonoperative treatment options and surgical indications	- Able to classify disease stage/severity and recognizes implications of disease processes (OA, femoroacetabular impingement [FAI], inflammatory arthritis, osteonecrosis) - Understands the importance of comorbidities, thromboembolic prophylaxis, infection prevention and diagnosis - Correlates anatomic knowledge to imaging findings on advanced imaging studies - Understands the effects of intervention on natural history of hip and knee arthritis - Understands basic presurgical planning and templating - Understands basic implant choices (eg, cement and uncemented fixation, levels of constraint)	- Demonstrates knowledge of current literature and alternative treatments - Understands biomechanics - Understands alternative surgical approaches (eg, nonarthroplasty, arthroscopy, osteotomy) - Understands alternative implant choices/biomaterials (eg, alternative bearings, unicompartmental approaches)	- Understands controversies within the field - Applies understanding of natural history to clinical decision-making - Understands principles of failure mechanism of total hip replacement (THR) and total knee replacement (TKR) (eg, loosening, fracture, infection, osteolysis, instability) - Understands basic principles of revision THR and TKR	- Primary author/presenter of original work within the field - Understands revision THR and TKR implants (eg, metaphyseal versus diaphyseal fixation, tapered versus fully porous implants)

TABLE 20 HIP AND KNEE OSTEOARTHRITIS (OA)—PATIENT CARE

Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and performs basic physical exam - Appropriately orders basic imaging studies - Prescribes nonoperative treatments (eg, NSAIDs, physical therapy, assistive devices) - Provides basic perioperative management (eg, preoperative and postoperative assessment) - Lists potential complications (eg, infections, dislocations, thromboembolic disease, periprosthetic fracture, neurovascular compromise)	- Obtains focused history and performs focused exam - Appropriately interprets basic imaging studies - Manages nonoperative treatment (eg, NSAIDs, physical therapy, assistive devices, injections) - Completes preoperative planning with instrumentation and implants (eg, implant templating, instruments needed) - Capable of performing one basic surgical approach to the hip and knee - Provides postoperative management and rehabilitation (eg, orders appropriate perioperative medications and mobilization) - Capable of diagnosis and early management of complications (eg, infections, dislocations) - Assesses for risk of thromboembolic disease	- Appropriately orders and interprets advanced imaging studies (eg, MRI, CT, nuclear medicine imaging, and advanced radiographs views) - Appropriately recommends surgical intervention - Completes comprehensive preoperative planning with alternatives - Modifies and adjusts postoperative treatment plan as needed - Capable of surgically treating simple complications (eg, closed reduction, irrigation, and debridement) - Provides prophylaxis and manages thromboembolic disease	- Capable of performing alternative surgical approaches to the hip and knee arthritis - Capable of performing primary THR and TKR - Capable of treating complications both intraoperatively and postoperatively (eg, periprosthetic fractures, infections, instability)	- Competently performs 2 or more approaches to the hip and knee - Capable of performing complex primary and simple revision THR and TKR (eg, hip dysplasia, hip protrusio, valgus knee, loose components, unicarthritis) - Develops unique, complex postoperative management plans (eg, infections, dislocations, neurovascular compromise) - Surgically treats complex complications (eg, periprosthetic fractures, knee instability)

TABLE 2.1 HIP FRACTURE—MEDICAL KNOWLEDGE

Level 1	Level 2	Level 3	Level 4	Level 5
- Demonstrates knowledge of pathophysiology related to hip fracture - Correlates anatomic knowledge to imaging findings on basic imaging studies - Demonstrates knowledge of nonoperative treatment options and surgical indications	- Able to describe and classify fractures - Correlates anatomic knowledge to imaging findings on advanced imaging studies - Demonstrates knowledge of bone biology, osteoporosis, and bone health management - Demonstrates knowledge of natural history of hip fracture - Demonstrates knowledge of hip fracture anatomy and basic surgical approaches - Understands basic presurgical planning and templating - Understands comorbidities and effects on fracture treatment	- Demonstrates knowledge of current literature and alternative treatments - Understands the effects of intervention on natural history of hip fracture - Understands alternative surgical approaches	- Understands controversies within the field (eg, hemiarthroplasty versus total hip arthroplasty for displaced femoral neck fracture) - Applies understanding of natural history to clinical decision-making - Understands biomechanics and implant choices	Primary author/presenter of original work within the field

TABLE 2.2 HIP FRACTURE—PATIENT CARE

Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and performs basic physical exam - Appropriately orders basic imaging studies - Prescribes nonoperative treatments - Provides basic perioperative management - Lists potential complications	- Obtains focused history and performs focused exam - Appropriately interprets basic imaging studies - Prescribes and manages nonoperative treatment - Recognizes and evaluates fragility fractures (eg, orders appropriate workup and/or consultations) - Interacts with consultants regarding optimal patient management (eg, timing of surgery, medical management) - Completes preoperative planning with instrumentation and implants - Capable of performing a basic surgical approach to the hip fracture - Provides postoperative management and rehabilitation - Capable of diagnosis and early management of complications - Assesses risk for thromboembolic disease	- Completes comprehensive assessment of fracture patterns on imaging studies; recognizes reverse obliquity fractures - Interprets diagnostic studies for fragility fractures with appropriate management and/or referral - Arranges for long-term management of geriatric patients (eg, management of bone health, discharge planning to long-term care) - Completes comprehensive preoperative planning with alternatives - Capable of surgical repairs to a simple fracture (eg, stable intertrochanteric femur fracture, minimally displaced femoral neck fracture) - Modifies and adjusts postoperative treatment plan as needed - Provides prophylaxis and manages thromboembolic disease	- Capable of surgical repair to moderately complex fractures (eg, unstable intertrochanteric femur fracture) - Capable of treating complications both intraoperatively and postoperatively (eg, manages a postoperative infection)	- Capable of surgical repair of complex fractures (eg, open reduction internal fixation of femoral neck fracture) - Capable of surgical treatment of complex complications (eg, revision fixation after failed ORIF, intertrochanteric osteotomy)

TABLE 2.3 METASTATIC BONE LESION—MEDICAL KNOWLEDGE

Level 1	Level 2	Level 3	Level 4	Level 5
• Demonstrates knowledge of normal bone development • Correlates anatomic knowledge to imaging findings on basic imaging studies (eg, plain radiographs) • Demonstrates knowledge of most common sites of metastatic disease and primary sites of disease (eg, primary sites: breast, prostate, lung, kidney, thyroid)	• Demonstrates knowledge of pathophysiology related to destructive bone lesion (eg, understands the function of receptor activator of nuclear factor κ-B ligand [RANKL], osteoprotegerin [OPG], and osteoclasts in the bone turnover in skeletal metastasis) • Correlates anatomic knowledge to imaging findings on advanced imaging studies (eg, CT scan of chest/abdomen/ pelvis, MRI of spine) • Demonstrates some knowledge of natural history of destructive bone lesion (eg, understands behavior of various histologies [ie, lung versus breast cancer]; understands the different behavior of primary bone sarcoma versus bone metastasis) • Demonstrates knowledge of destructive bone lesion anatomy and basic surgical approaches (eg, understands the location of neurovascular structures in upper/lower extremities and pelvis; understands basic surgical approach to humeral and femoral nails) • Understands basic presurgical planning and templating • Demonstrates knowledge of nonoperative treatment options and surgical indications (eg, understands nonoperative options, including protected weight-bearing/radiation of lower extremity lesions, as well as bracing of upper extremity lesion)	• Demonstrates knowledge of current literature and alternative treatments (eg, alternative beam radiation, radiofrequency ablation, cryoablation, bisphosphonate use) • Understands indications for prophylactic fixation (eg, is aware of at least one scoring system [Mirels, Beals] as well as more nuanced factors [histology, response to treatment, etc]) • Understands the effects of intervention on natural history of destructive bone lesion • Understands alternative surgical approaches (eg, understands the role of resection/prosthetic replacement versus intramedullary stabilization depending on location of lesion) • Understands role of radiation or medical therapy (versus surgical options; their use postoperatively; specific role of chemotherapy, hormonal therapy, bisphosphonates for common primary cancers that spread to bone) • Demonstrates knowledge of alternatives for primary sarcoma of bone (eg, understands role of resection versus palliative care; understands role of limb salvage versus amputation)	• Understands controversies within the field (eg, resection/prosthetic reconstruction versus intramedullary fixation; short versus long stem hip reconstruction; bipolar versus total hip arthroplasty [THA] for hip lesions; resection of solitary bone metastasis) • Formulates differential diagnosis based on imaging studies • Able to perform risk assessment of operative versus nonoperative care (eg, understands concepts of nutritional status, current function/activity, medical comorbidities/American Society of Anesthesiologists [ASA] level) • Applies understanding of natural history to clinical decision-making (eg, understands balance of expected life span to planned intervention [ie, complex acetabular reconstruction for patient with widespread lung metastasis and 6 wk to live]; develop shared decision-making skills for patient discussions/interactions) • Understands biomechanics and implant choices (eg, understands concepts of failure in compression versus tension; understands the benefit of supplemental methylmethacrylate; understands the pros/cons of plate versus rod fixation)	• Primary author/presenter of original work within the field

TABLE 24 METASTATIC BONE LESION—PATIENT CARE

Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and performs basic physical exam (eg, pain, function, past medical/surgical/social/family history, review of systems, heart, lungs, extremity exam, including range of motion, strength, sensation, skin changes, tenderness) - Appropriately orders basic imaging studies (eg, plain radiographs, including AP/lateral of the lesion joint above and below the lesion) - Prescribes nonoperative treatments (eg, including protected weight-bearing bracing, no intervention) - Provides basic perioperative management (eg, intravenous [IV] antibiotics, IV fluids, DVT prophylaxis, pain control, nutrition) - Lists potential complications (eg, including infection, wound compromise, neurovascular compromise, tumor progression, prosthetic hip dislocation, DVT/pulmonary embolism [PE], pneumonia)	- Obtains focused history and performs focused exam (eg, history: specific questions re: past history of cancer or radiation, prior treatments; preexisting pain, smoking or chemical exposure, constitutional symptoms such as fever; physical exam: nodes lymph node involvement, lumps/nodes) - Appropriately interprets basic imaging studies (eg, able to describe the radiographic appearance [osteolytic, osteoblastic, etc]) - Prescribes and manages nonoperative treatment (eg, understands when to have the patient back to clinic for follow-up; understands when to order new radiographic imaging studies) - Completes preoperative planning with instrumented and implants - Performs one basic surgical approach to the destructive bone lesion - Provides postoperative management and rehabilitation (eg, understands weight-bearing issues and role of physical/occupational therapy [PT/OT]) - Capable of diagnosis and early management of complications (eg, able to diagnose: infection, DVT/PE, wound breakdown, neurovascular compromise, hardware failure)	- Appropriately orders and interprets advanced imaging studies/lab studies (eg, 3D radiographic studies to include CT and MRI, laboratory studies including role of serum protein electrophoresis [SPEP]/urine protein electrophoresis [UPEP], prostate-specific antigen [PSA], other tumor markers) - Recommends complex nonoperative treatment (radiofrequency ablation [RFA] or cryoablation, bisphosphonates kyphoplasty or vertebroplasty) - Completes comprehensive preoperative planning with alternatives - Completes preoperative preparation and consultation (eg, oncology, radiation oncology, counseling) - Modifies and adjusts postoperative treatment plan as needed - Capable of treating postoperative complications (eg, nonoperative treatment of infection, wound breakdown, DVT/PE)	- Recommends appropriate biopsy, including biopsy alternatives and appropriate techniques (eg, understands role of open biopsy versus needle biopsy) - Capable of performing prophylactic fixation based on diagnosis and risk (eg, able to perform prophylactic intramedullary stabilization of femur, prophylactic bipolar hemiarthroplasty of the hip) - Capable of performing internal fixation on impending or actual pathologic fractures (eg, able to perform intramedullary stabilization of pathologic femoral or humeral fracture, bipolar hip hemiarthroplasty for pathologic femoral neck fracture) - Capable of performing alternative surgical approaches to the destructive bone lesion (eg, understands approaches to the hip for prosthetic reconstruction; understands approaches for resection of proximal humerus, distal femur and proximal tibia) - Capable of surgical treatment of infection or wound breakdown	- Discusses prognosis and end-of-life care with patients and family - Independently performs open biopsy - Performs endoprosthetic reconstruction for periparticular lesions (options include megaprosthesis of proximal humerus, proximal femur, distal femur, proximal tibia) - Develops unique, complex postoperative management plans - Surgically treats complex complications (eg, surgical treatment of hardware failure, periprosthetic fracture, progression of disease)

MENISCAL TEAR—MEDICAL KNOWLEDGE				
Level 1	Level 2	Level 3	Level 4	Level 5
- Demonstrates knowledge of pathophysiology related to meniscal tear - Correlates anatomic knowledge to imaging findings on basic imaging studies (eg, joint space height, Fairbank changes) - Understands mechanism of injury - Demonstrates some knowledge of natural history of meniscal tear	- Correlates anatomic knowledge to imaging findings on advanced imaging studies (eg, tear personality, chondral injury/changes) - Understands biology of meniscal healing - Understands the effects of intervention on natural history of meniscal tear - Demonstrates knowledge of meniscal anatomy and basic surgical approaches - Demonstrates knowledge of nonoperative treatment options and surgical indications	- Demonstrates knowledge of current literature and alternative treatments - Understands rehabilitation mechanics (eg, quadriceps strength closed versus open chain) - Understands biomechanics and implant choices - Understands alternative surgical approaches (eg, repair versus debridement)	- Understands controversies within the field (eg, repair techniques) - Understands how to prevent/avoid potential complications - Applies understanding of natural history to clinical decision-making	Primary author/presenter of original work within the field

MENISCAL TEAR—PATIENT CARE				
Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and performs basic physical exam (eg, age, gender, HPI, PMHx, social history, ROM, joint tenderness, effusion, neurovascular status) - Appropriately orders basic imaging studies (eg, plain film radiographs) - Prescribes nonoperative treatments - Provides basic perioperative management (eg, neurovascular status, ROM, brace) - Lists potential complications (eg, pain, infection, neurovascular injury, loss of motion, degenerative joint disease [DJD])	- Obtains focused history and performs focused exam (eg, McMurray, Steinmann, applies compression) - Appropriately interprets basic imaging studies (eg, standing radiographs as needed, Fairbank changes) - Prescribes and manages nonoperative treatment (eg, quadriceps strength closed chain) - Injects/aspirates knee - Examines knee under anesthesia - Provides postoperative management and rehabilitation (eg, ROM, quadriceps strength closed chain, WB status) - Capable of diagnosis and early management of complications	- Appropriately orders and interprets advanced imaging studies (eg, MRI findings) - Provides complex nonoperative treatment (eg, concomitant injuries—ligament, fractures) - Capable of performing diagnostic arthroscopy and meniscal debridement - Modifies and adjusts postoperative treatment plan as needed (eg, knee arthrofibrosis, continued pain)	- Capable of performing meniscal repair—all techniques open and arthroscopic - Capable of performing alternative surgical approaches to a meniscal tear - Capable of treating complications both intraoperatively and postoperatively	- Capable of performing revision of meniscal repair or meniscal transplant - Capable of treating complex complications

PEDIATRIC SEPTIC HIP—MEDICAL KNOWLEDGE					
TABLE 2.7	Level 1	Level 2	Level 3	Level 4	Level 5
	• Demonstrates knowledge of common presentation of hip septic arthritis • Demonstrates knowledge of basic hip anatomy • Demonstrates knowledge of basic imaging studies • Demonstrates knowledge of appropriate laboratory studies	• Demonstrates knowledge of pathophysiology of joint damage related to septic arthritis • Demonstrates knowledge of basic surgical approach • Demonstrates knowledge of the differential diagnosis of the hip • Understands natural history and the effects of intervention • Demonstrates knowledge of advanced imaging studies	• Demonstrates knowledge of the vascular supply in the skeletally immature hip • Demonstrates knowledge of microbiology and antibiotic choices • Demonstrates knowledge of potential complications • Demonstrates knowledge of clinical and laboratory data relevant to differential diagnosis	• Demonstrates knowledge of options and anatomy for surgical approaches • Demonstrates knowledge of atypical infecting organisms and management options	• Participates in research in the field with publication

PEDIATRIC SEPTIC HIP—PATIENT CARE					
TABLE 2.8					
Level 1	Level 2	Level 3	Level 4	Level 5	
- Obtains history and performs basic physical exam - Orders appropriate initial imaging and laboratory studies - Provides initial management - Lists potential complications	- Obtains focused history and physical; recognizes findings commonly associated with hip septic arthritis - Orders appropriate advanced imaging studies (eg, MRI, ultrasound) - Interprets basic imaging and laboratory studies - Selects appropriate antibiotics - Diagnoses complications (eg, drug reactions)	- Recognizes factors that could predict complications or poor outcome - Appropriately orders and capable of performing hip aspiration - Interprets advanced imaging studies and results of hip aspiration - Able to develop a basic preoperative plan	- Assimilates all diagnostic testing and makes a decision about the need for surgical drainage - Capable of performing hip arthrotomy and drainage - Modifies postoperative plan based on response to treatment (eg, patient fails to improve postoperatively) - Capable of treating simple complications; repeat incision for persistent wound drainage, drug reaction	- Able to develop a comprehensive preoperative plan that includes options based on intraoperative findings (eg, managing dislocated hip) - Manages complex complications; late hip dislocation, fracture, osteomyelitis, chondrolysis, avascular necrosis	

TABLE 2.9 ROTATOR CUFF INJURY—MEDICAL KNOWLEDGE

Level 1	Level 2	Level 3	Level 4	Level 5
- Understands surgical anatomy (eg, rotator cuff muscles/tendons, deltoid, axillary nerve position, acromion, biceps, labrum) - Demonstrates knowledge of basic imaging studies: radiographs (eg, true AP, axillary, supraspinatus outlet)	- Demonstrates knowledge of surgical indications (eg, nonoperative management, therapy, injections, rotator cuff repair, subacromial decompression) - Demonstrates knowledge of basic surgical approaches and portal placement (eg, anterior, subacromial, posterior, accessory posterior) - Understands pathophysiology related to rotator cuff injury (eg, impingement, partial thickness cuff tears, extrinsic versus intrinsic theory of cuff tearing) - Understands biology of soft tissue tendon healing - Demonstrates knowledge of advanced imaging studies/laboratory studies (eg, MRI, ultrasound, CT arthrogram)	- Demonstrates knowledge of current literature and alternatives - Understands pathophysiology of concomitant injuries (eg, biceps tendinitis, acromioclavicular joint disease, labral pathology, arthritis) - Understands rehabilitation mechanics (eg, Neer Phase 1–3) - Understands biomechanics and implant choices - Understands natural history of rotator cuff disease (eg, symptomatic versus asymptomatic cuff tears, impingement, intrinsic versus extrinsic mechanisms)	- Understands controversies within field, eg, single versus double row repairs, partial repair of massive tears, suprascapular nerve dysfunction - Understands end-stage rotator cuff tear arthropathy and treatment options - Understands tear pattern, appropriate repair, biceps tenodesis (eg, L-shaped, concentric, U-shaped, tissue quality, biceps subluxation) - Understands pathophysiology of failed rotator cuff repair (eg, biology, implant failure, stiffness, infection, smoking, tendon quality, vascularity)	- Participates in research in the field with publication; cites/teaches junior residents appropriate outcomes studies - Understands treatment for massive/irreparable tears - Understands treatments of intraoperative complications (eg, misalignment of suture anchor, poor exposure, hemostasis, tuberosity fracture, and anchor breakage)

TABLE 3.0 ROTATOR CUFF INJURY—PATIENT CARE

Level 1	Level 2	Level 3	Level 4	Level 5
- Obtains history and performs basic physical examination (eg, age, gender, smoker, trauma, night pain, weakness, inspection for atrophy, ROM) - Lists surgical complications (eg, infection, stiffness, RSD, retear)	- Obtains focused history and performs physical examination (eg, provocative tests, Neer/Hawkins, O'Briens, lag signs, pseudoparalysis, lift-off, belly press, scapular dyskinesia) - Orders basic imaging studies - Performs basic surgical approaches and portal placement (eg, anterior, subacromial, posterior, accessory posterior) - Performs simple shoulder procedures (eg, subacromial injection) - Prescribes nonoperative treatment - Provides basic postoperative management (eg, phases of cuff repair rehabilitation, phase 1–3) - Diagnoses surgical complications	- Interprets basic imaging studies (eg, rotator cuff tear on MRI, muscle atrophy on MRI, proximal humeral migration on x-ray) - Completes preoperative planning with instrumentation and implants (eg, patient positioning, arthroscopic equipment, anchors) - Capable of performing diagnostic arthroscopy, subacromial decompression, distal clavicle resection, biceps tenotomy	- Able to order and interpret advanced imaging studies (eg, tear size, muscle atrophy, labral tears, arthritis, subscapularis tears) - Completes comprehensive preoperative planning and alternatives - Capable of performing rotator cuff repair - Appropriately interprets postoperative imaging studies/implant positioning - Modifies and adjusts postoperative rehabilitation plan as needed (eg, modify for massive cuff repairs, postoperative stiffness) - Treats complications both intraoperatively and postoperatively (eg, irrigation/debridement for infections, proper infection treatment protocol, infectious disease consultation)	- Capable of performing complex arthroscopic rotator cuff repairs, revision rotator cuff repair, tendon transfers - Surgically treats complex complications (eg, revision rotator cuff repair with tendon transfer, reverse shoulder replacement for anterosuperior escape)

TABLE 31 PEDIATRIC SUPRACONDYLAR HUMERUS FRACTURE—MEDICAL KNOWLEDGE

Level 1	Level 2	Level 3	Level 4	Level 5
- Demonstrates knowledge of pathophysiology related to supracondylar humerus fracture (eg, fall on outstretched hand, extension mechanism most common; fracture occurs initially on tension side with disruption of periosteum and soft tissues on convexity) - Demonstrates knowledge of elbow anatomy (eg, ossification centers in growing elbow, bone anatomy, soft tissue anatomy) - Correlates anatomic knowledge to imaging findings on basic imaging studies (eg, location of fracture, involvement of articular surface or not) - Demonstrates knowledge of nonoperative treatment options and surgical indications (eg, safe casting/splinting principles to minimize risk of compartment syndrome/vascular insufficiency)	- Understands the biology of fracture healing (eg, hematoma formation, inflammation, early soft callus, hard callus, remodeling) and the importance of periosteum and periosteal bone formation in pediatric fractures - Correlates anatomic knowledge to imaging findings on advanced imaging studies (eg, rare need for arthrogram/MRI to assess articular surface) - Understands mechanism of injury and fracture classification (eg, extension versus flexion types, Gartland classification, elbow hyperextension common in 4–7-y-old children) - Demonstrates knowledge of natural history of supracondylar humerus fracture (eg, high incidence malunion in displaced fractures treated closed, most nondisplaced fractures and displaced fractures treated with closed reduction and percutaneous pinning [CRPP] function well, and possible vascular injury) - Demonstrates knowledge of supracondylar humerus fracture anatomy and basic surgical approaches (eg, direction of displacement and neurological/vascular structures at risk affects choice of approach) - Understands basic presurgical planning; anticipates obstacles to reduction, understands reduction maneuvers	- Demonstrates knowledge of current literature and alternative treatments (eg, immobilization for nondisplaced fractures; closed reduction and pinning for displaced fractures; alternatives rarely used—olecranon traction for severe swelling) - Demonstrates knowledge of nerve anatomy relative to pin fixation (eg, location of ulnar nerve and changes with elbow position; locations of median and radial nerves) - Understands rehabilitation protocol (eg, regaining motion over 6 wk to 6 mo) - Understands the effects of intervention on natural history of supracondylar humerus fracture; avoid malunion, Volkmann ischemic contracture - Understands biomechanics and implant choices (eg, effect of pin size, pin placement [spread at fracture], fracture pattern/comminution)	- Understands controversies within the field; indications for reduction of mildly angulated type II fractures, indications/criteria for open reduction in closed fractures; management of perfused pulseless supracondylar fracture - Understands how to avoid/prevent potential complications (eg, malunion, nerve injury, vascular complications, ischemic contracture, compartment syndrome, pin tract infections) - Applies understanding of natural history to clinical decision-making (eg, intervention to improve outcome, prevent complications) - Understands alternative surgical approaches (eg, anterior, anteromedial, anterolateral, medial, posterior approaches)	Primary author/presenter of original work within the field

PEDIATRIC SUPRACONDYLAR HUMERUS FRACTURE—PATIENT CARE					
TABLE 3.2					
Level 1	Level 2	Level 3	Level 4	Level 5	
- Obtains history and performs basic physical exam (eg, injury mechanism, radial and ulnar pulse assessment) - Appropriately orders basic imaging studies (eg, AP and lateral elbow radiographs, oblique views if concern for condylar component) - Prescribes nonoperative treatments - Provides basic perioperative management - Lists potential complications	- Recognizes vascular, nerve, or other associated injuries; assesses median, radial, and ulnar nerves, role of Doppler arterial assessment and perfusion assessment, differentiates anterior interosseous nerve versus complete median nerve palsy - Appropriately interprets basic imaging studies and recognizes fracture patterns - Splints or casts fracture appropriately (eg, flexion less than 90°; accommodates for swelling potential) - Completes preoperative planning with instrumentation and implants - Performs basic management of supracondylar humerus fracture; uncomplicated closed reduction - Provides postoperative management and rehabilitation (eg, cast or splint care, manage swelling, monitor neurological and vascular status, office pin removal) - Capable of diagnosis and early management of complications, including compartment syndrome, pin tract sepsis, cast problems	- Recognizes factors that could predict difficult reduction and postoperative complication risk (eg, abnormal vascular examination, neurological deficits, brachialis sign, or severe soft tissue swelling, associated forearm fracture) - Appropriately orders and interprets advanced imaging studies - Completes comprehensive preoperative planning with alternatives; recognizes fracture patterns that may preclude lateral entry only pinning or necessitate ORIF - Modifies and adjusts postoperative treatment plan as needed (eg, recognizes deviations from typical postoperative course)	- Capable of performing a closed reduction and pinning - Capable of removing obstacles to reduction through closed or open methods (eg, milking maneuver, open reduction) - Capable of performing alternative surgical approaches to the supracondylar humerus fracture (eg, milking maneuver, open approaches) - Capable of surgically treating simple complications (eg, compartment release, wound problems)	- Manages open fractures and fractures with neurological and vascular complications; open approaches and dissect vascular and neurological structures, appropriate exposure and debridement for open fractures - Develops unique, complex postoperative management plans - Capable of surgically treating complex complications; revision fixation, malunion (eg, osteotomy for severe cubitus varus)	

COMPASSION, INTEGRITY, AND RESPECT FOR OTHERS AS WELL AS SENSITIVITY AND RESPONSIVENESS TO DIVERSE PATIENT POPULATIONS, INCLUDING BUT NOT LIMITED TO, DIVERSITY IN GENDER, AGE, CULTURE, RACE, RELIGION, DISABILITIES, AND SEXUAL ORIENTATION; KNOWLEDGE ABOUT RESPECT FOR AND ADHERENCE TO THE ETHICAL PRINCIPLES RELEVANT TO THE PRACTICE OF MEDICINE, REMEMBERING IN PARTICULAR THAT RESPONSIVENESS TO PATIENTS THAT SUPERSEDES SELF-INTEREST IS AN ESSENTIAL ASPECT OF MEDICAL PRACTICE—PROFESSIONALISM 1					
TABLE 3.3					
Level 1	Level 2	Level 3	Level 4	Level 5	
- Consistently demonstrates behavior that conveys caring, honesty, and genuine interest in patients and families - Recognizes the diversity of patient populations with respect to gender, age, culture, race, religion, disabilities, sexual orientation, and socioeconomic status - Recognizes the importance and priority of patient care, with an emphasis on the care that the patient wants and needs; demonstrates a commitment to this value	- Demonstrates an understanding of the importance of compassion, integrity, respect, sensitivity, and responsiveness while exhibiting these attitudes consistently in common and uncomplicated situations - Consistently recognizes ethical issues in practice; discusses, analyzes, and manages in common and frequent clinical situations, including socioeconomic variances in patient care	- Exhibits these attitudes consistently in complex and complicated situations - Recognizes how own personal beliefs and values affect medical care - Knowledgeable about the beliefs, values, and practices of diverse patient populations and the potential effect on patient care - Recognizes ethical violations in professional and patient aspects of medical practice	- Develops and uses an integrated and coherent approach to understanding and effectively working with others to provide good medical care that integrates personal standards with standards of medicine - Consistently considers and manages ethical issues in practice - Consistently practices medicine and specialty care in a manner that upholds values and beliefs of self and medicine	- Demonstrates leadership and mentoring regarding these principles of bioethics - Manages ethical misconduct in patient management and practice	

TABLE 3.4

ACCOUNTABILITY TO PATIENTS, SOCIETY, AND THE PROFESSION; PERSONAL RESPONSIBILITY TO MAINTAIN EMOTIONAL, PHYSICAL, AND MENTAL HEALTH—PROFESSIONALISM 2

Level 1	Level 2	Level 3	Level 4	Level 5
- Understands when assistance is needed and is willing to ask for help - Exhibits basic professional responsibilities, such as timely reporting for duty, being rested and ready to work, displaying appropriate attire and grooming, and delivering patient care as a functional physician - Aware of the basic principles and aspects of general maintenance of emotional, physical, mental health, and issues related to fatigue/sleep deprivation	- Recognizes limits of knowledge in common clinical situations and asks for assistance - Recognizes value of humility and respect toward patients and associate staff - Demonstrates adequate management of personal, emotional, physical, mental health, and fatigue	- Consistently recognizes limits of knowledge in uncommon and complicated clinical situations; develops and implements plans for the best possible patient care - Assesses application of principles of physician wellness, alertness, delegation, teamwork, and optimization of personal performance to the practice of medicine - Seeks out assistance when necessary to promote and maintain personal, emotional, physical, and mental health	- Mentors and models personal and professional responsibility to colleagues - Recognizes signs of physician impairment and demonstrates appropriate steps to address impairment in colleagues	- Develops organizational policies and education to support the application of these principles in the practice of medicine - Practices are consistent with the American Academy of Orthopaedic Surgeons (AAOS) Standards of Professionalism

TABLE 3.5

SELF-DIRECTED LEARNING—PRACTICE-BASED LEARNING AND IMPROVEMENT 1: (1) IDENTIFYING STRENGTHS, DEFICIENCIES, AND LIMITS IN ONE’S KNOWLEDGE AND EXPERTISE; (2) ASSESSING PATIENT OUTCOMES AND COMPLICATIONS IN ONE’S OWN PRACTICE; (3) SETTING LEARNING AND IMPROVEMENT GOALS; (4) IDENTIFYING AND PERFORMING APPROPRIATE LEARNING ACTIVITIES; AND (5) USING INFORMATION TECHNOLOGY TO OPTIMIZE LEARNING AND IMPROVE PATIENT OUTCOMES

Level 1	Level 2	Level 3	Level 4	Level 5
- Acknowledges gaps in personal knowledge and expertise, and frequently asks for feedback from teachers and colleagues - Demonstrates computer literacy and basic computer skills in clinical practice	- Continually assesses performance by evaluating feedback and assessments - Develops a learning plan based on feedback with some external assistance - Demonstrates use of published review articles or guidelines to review common topics in practice - Uses patient-care experiences to direct learning	- Accurately assesses areas of competence and deficiencies and modifies learning plan - Demonstrates the ability to select an appropriate evidence-based information tool to answer specific questions while providing care	- Performs self-directed learning without external guidance - Critically evaluates and uses patient outcomes to improve patient care	Incorporates practice change based on new evidence

TABLE 3.6 LOCATE, APPRAISE, AND ASSIMILATE EVIDENCE FROM SCIENTIFIC STUDIES TO IMPROVE PATIENT CARE—PRACTICE-BASED LEARNING AND IMPROVEMENT 2				
Level 1	Level 2	Level 3	Level 4	Level 5
- Describes basic concepts in clinical epidemiology, biostatistics, and clinical reasoning - Categorizes the study design of a research study	- Ranks study designs by their level of evidence - Identifies bias affecting study validity - Formulates a searchable question from a clinical question	- Applies a set of critical appraisal criteria to different types of research, including syntheses of original research findings, systematic reviews and meta-analyses, and clinical practice guidelines - Critically evaluates information from others: colleagues, experts, industry representatives, and patient-delivered information	- Demonstrates a clinical practice that incorporates principles and basic practices of evidence-based medicine and information mastery - Cites evidence supporting several common practices	Independently teaches and assesses evidence-based medicine and information mastery techniques

TABLE 3.7 SYSTEMS THINKING, INCLUDING COST-EFFECTIVE PRACTICE—SYSTEMS-BASED PRACTICE 1				
Level 1	Level 2	Level 3	Level 4	Level 5
- Describes basic levels of systems of care (eg, self-management to societal) - Understands the economic challenges of patient care in the health care system	Gives examples of cost and value implications of care he or she provides (eg, gives examples of alternate sites of care resulting in different costs for individual patients)	- Orders and schedules tests in appropriate systems for individual patients balancing expenses and quality - Successfully navigates the economic differences of the health care system	- Effectively manages clinic team and schedules for patient and work-flow efficiency - Uses evidence-based guidelines for cost-effective care	Leads systems change at micro and macro level (eg, manages operating room [OR] team and patient flow in a multicase OR day)

TABLE 3.8 RESIDENT WILL WORK IN INTERPROFESSIONAL TEAMS TO ENHANCE PATIENT SAFETY AND QUALITY CARE—SYSTEMS-BASED PRACTICE 2				
Level 1	Level 2	Level 3	Level 4	Level 5
Recognizes importance of complete and timely documentation in teamwork and patient safety	Uses checklists and briefings to prevent adverse events in health care	Participates in quality improvement or patient safety program and/or project	- Maintains team situational awareness and promotes “speaking up” with concerns - Incorporates clinical quality improvement and patient safety into clinical practice	- Develops and publishes quality-improvement project results - Leads local or regional quality-improvement project

USES TECHNOLOGY TO ACCOMPLISH SAFE HEALTH CARE DELIVERY—SYSTEMS-BASED PRACTICE 3				
TABLE 39				
Level 1	Level 2	Level 3	Level 4	Level 5
Explains the role of the electronic health record (EHR) and computerized physician order entry (CPOE) in the prevention of medical errors	- Appropriately and accurately enters patient data in EHRs - Effectively uses electronic medical records in patient care	Reconciles conflicting data in the medical record	Contributes to reduction of risks of automation and computerized systems by reporting system problems	Recommends systems redesign for faculty computerized processes

COMMUNICATION—INTERPERSONAL AND COMMUNICATION SKILLS 1				
TABLE 40				
Level 1	Level 2	Level 3	Level 4	Level 5
Communicates with patients about routine care (eg, actively seeks and understands the patient's/family's perspective; able to focus on the patient's chief complaint and ask pertinent questions related to that complaint)	Communicates competently within systems and with other care providers, and provides detailed information about patient care (eg, demonstrates sensitivity to patient- and family-related information gathering/sharing to social cultural context; begins to engage patient in patient-based decision-making, based on the patient's understanding and ability to carry out the proposed plan; demonstrates empathic response to patient's and family's needs; actively seeks information from multiple sources, including consultations; avoids being a source of conflict; is able to obtain informed consent [risks, benefits, alternatives, and expectations])	Communicates competently in difficult patient circumstances (eg, able to customize emotionally difficult information, such as end-of-life or loss-of-limb discussions; supports patient and family; engages in patient-based decision-making incorporating patient and family/cultural values and preferences)	Communicates competently in complex/adversarial situations (eg, understand a patient's secondary motivations in the treatment of his or her care—drug seeking, disability issues, and legal cases; able to sustain working relationships during complex and challenging situations, including transitions of care—treatment of a metastatic pathologic fracture; able to manage conflict with peers, subordinates, and superiors)	Demonstrates leadership in communication activities (eg, coaches others to improve communication skills; engages in self-reflection on how to improve communication skills)

TEAMWORK (EG, PHYSICIAN, NURSING AND ALLIED HEALTH CARE PROVIDERS, ADMINISTRATIVE AND RESEARCH STAFF)—INTERPERSONAL AND COMMUNICATION SKILLS 2				
Level 1	Level 2	Level 3	Level 4	Level 5
• Recognizes and communicates critical patient information in a timely and accurate manner to other members of the treatment team • Recognizes and communicates role as a team member to patients and staff • Responds to requests for information, eg, laboratory results, accurate and timely progress notes, answers pages in a timely manner	• Supports and respects decisions made by team • Actively participates in team-based care; supports activities of other team members, communicates role of other team members to the patient and family, eg, handoffs, transitions of care, communicating with other health care providers and staff members	• Able to facilitate, direct, and delegate team-based patient care activities • Understands the operating room (OR) team leadership role and obligations, eg, leads daily rounds, communicates plan of action with OR personnel	• Leads team-based care activities and communications • Able to identify and rectify problems with team communication, eg, organizes and verifies handoff rounds, coverage issues	• Seeks leadership opportunities within professional organizations • Able to lead/facilitate meetings within organization/system