Supplemental Guide: Orthopaedic Surgery

ACGME

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Milestones Supplemental Guide

This document provides additional guidance and examples for the Orthopaedic Surgery Milestones. This is not designed to indicate any specific requirements for each level, but to provide insight into the thinking of the Milestone Work Group.

Included in this document is the intent of each Milestone and examples of what a Clinical Competency Committee (CCC) might expect to be observed/assessed at each level. Also included are suggested assessment models and tools for each subcompetency, references, and other useful information.

Review this guide with the CCC and faculty members. As the program develops a shared mental model of the Milestones, consider creating an individualized guide (Supplemental Guide Template available) with institution/program-specific examples, assessment tools used by the program, and curricular components, including rotation mapping.

Additional tools and references, including the Milestones Guidebook, Clinical Competency Committee Guidebook, and Milestones Guidebook for Residents and Fellows, are available on the Resources page of the Milestones section of the ACGME website.

Patient Care 1: Operative Management of Fractures and Dislocations **Overall Intent:** To perform core procedures for fractures and dislocations, including development of an operative plan and managing complications	
Milestones	**Examples**
Level 1 *Develops a simple surgical plan, with assistance*	● Appropriately orders basic imaging studies ● Describes basic understanding of relevant reduction method and appropriate fixation technique (percutaneous, external fixation, plate, nail) ● Demonstrates proper patient positioning and tourniquet placement for extremity procedures
Demonstrates basic surgical skills (e.g., wound closure) and assists with procedures	● Demonstrates proper sterile prep-and-drape and accurately marks incision ● Displays atraumatic soft tissue handling with superficial dissection and closure ● Demonstrates competence in knot tying (hand and instrument) ● Exhibits proper use of drill ● Explains radiation exposure mitigation factors ● Exhibits proper technique in sterile dressing and relevant splint application
Identifies and reports simple complications	● Demonstrates competence in neurological assessment ● Explains examples of typical postoperative neurological and vascular deficits, including compartment syndrome, and method for reporting ● Identifies wound dehiscence during wound check and reports appropriately ● Identifies potential narcotic misuse/dependence and describes appropriate method for reporting
Level 2 *Independently develops a simple surgical plan*	● Appropriately interprets basic imaging studies ● Explains rationale for method of fracture fixation, incorporating concepts of absolute and relative stability ● Describes equipment needs for procedure and institutional protocol to ensure availability ● Demonstrates proper patient positioning for hip, pelvic, and spine procedures ● Describes proper decision-making regarding antibiotic management and venous thromboembolism (VTE) prophylaxis ● Describes short-term rehabilitation plan
Performs surgical approach, with minimal assistance	● Performs closed reduction of core fractures listed below with minimal assistance ● Performs provisional operative reduction of core fractures listed below with assistance ● Independently places uniplanar external fixator pins for a tibial fracture and applies fixator frame with assistance ● Demonstrates appropriate analysis of fluoroscopic imaging

	● Exhibits competence in percutaneous pin placement with direction ● Demonstrates ability to progress through deeper layers of exposure with minimal periosteal stripping ● Identifies proper starting point for intramedullary and cannulated screw fixation for a femur fracture ● Exhibits competence in multi-layer closure
Manages simple complications	● Identifies and independently initiates treatment of neurovascular deficits with attention to splint, limb position, compartment pressure measurements ● Identifies potential VTE complication and initiates work-up and treatment ● Appropriately identifies wound dehiscence and presents treatment plan including decision making regarding local wound care, antibiotics, and potential need for surgical debridement and repeat closure ● Initiates management plan for narcotic misuse/dependence ● Plans core procedures listed in Level 3 ● Performs surgical approach core procedures listed in Level 3
Level 3 *Independently develops a surgical plan for core procedures that includes identification of potential challenges and technical complexities*	● Appropriately interprets advanced imaging studies ● Develops a comprehensive surgical plan for a femoral neck fracture to include proper patient positioning, imaging (type and orientation), surgical approach, detailed method of reduction and fixation, instrumentation, and contingency plans ● Includes a comprehensive plan for post-operative care including immobilization, weight bearing, and rehabilitation
Performs critical steps of core procedures, with assistance	● Confirms availability of necessary equipment ● Performs provisional reduction of core fractures with minimal assistance ● Performs closed reduction of core fractures without assistance ● Independently applies uniplanar external fixator ● Exhibits competence in percutaneous pin placement with minimal assistance ● Explains proper soft tissue management and debridement of open fractures ● Performs atraumatic nerve dissection in exposure of fracture (e.g., radial nerve) ● Performs upper and lower limb fasciotomy with assistance ● Demonstrates competence in assessing proper guidewire placement, measurement (screw/nail) and drilling/reaming ● Performs lag screw fixation with minimal assistance and neutralization plate application independently

Identifies complex complications	● Demonstrates competence in obtaining proper fluoroscopic images for pelvic and hip fractures ● Places appropriate splint, cast, or brace without assistance ● Identifies associated patient and soft tissue factors that may delay or modify surgical approach ● Accurately describes associated soft tissue injuries with a bimalleolar fracture (and proposed management) ● Identifies intra-operative complications (loss of reduction, screw penetration, periprosthetic fracture) and describes treatment plan ● Describes signs and symptoms of early post-operative infection and initiates work-up and preliminary treatment ● Performs critical steps of core procedures in: ○ Carpal dislocation ○ Carpal fracture ○ Debridement of open fractures ○ Distal femoral fracture ○ Distal humeral fracture ○ Distal radius fracture ○ Elbow dislocation ○ Fasciotomy ○ Femoral neck fracture ○ Hindfoot and midfoot fractures and dislocations ○ Intertrochanteric fracture ○ Metacarpal/phalangeal dislocation ○ Proximal radius/ulna shaft fracture ○ Radius/ulna shaft fracture ○ Tibial pilon fracture ○ Tibial shaft fracture ○ Treatment of nonunion or malunion fracture ○ Unilateral external fixation ○ Unimalleolar/bimalleolar fracture
Level 4 *Independently develops a surgical plan for complex procedures, including contingencies for complications*	● Has completed Level 3 for all core procedures listed ● Incorporates the concepts of damage control, staged reconstruction, use of distraction devices, surgical windows, bridge plating, and hybrid fixation

	● Develops contingency plans for intra-operative complications, including potential neurovascular injury, fixation failure, and periprosthetic fracture ● Understands timing and triage of procedures in the patient with multiple injuries
Independently performs core procedures; performs complex procedures, with assistance	● Independently performs closed reduction and uniplanar external fixator application ● Applies multiplanar external fixator, with assistance ● Describes algorithm for management of irreducible dislocations ● Demonstrates proper soft tissue management and debridement of open fractures ● Performs upper- and lower-limb fasciotomy without assistance; describes appropriate wound management ● Demonstrates competence in all technical aspects of intramedullary and plate fixation of core fractures ● Performs advanced reduction techniques (blocking screws, distraction devices, push/pull), with assistance ● Performs surgical exposure and fixation of pelvic/acetabular fractures, with assistance ● Performs percutaneous fixation of pelvic fractures, with assistance
Develops a plan for managing complex complications	● Identifies and appropriately manages simple intra-operative screw penetration, loss of reduction, and periprosthetic fracture ● Identifies and properly manages associated ligamentous injuries (syndesmosis, collateral ligament) primarily ● Demonstrates appropriate temporizing management of soft tissue defect (negative pressure wound therapy, antibiotic beads, etc.), and explains indications for plastic surgery consultation ● Performs surgical debridement for early post-operative infection, and describes rationale for prosthetic retention/removal ● Explains the indications for early amputation of mangled limb ● Describes a plan for management of infection associated with loss of fixation ● Describes a plan for management of delayed union/nonunion/complex regional pain syndrome ● Recognizes own limitations and indications for temporizing measures and referral ● Develops appropriate relationships that facilitate concurrent management of multiple issues
	● Independently performs all core procedures listed in Level 3 ● Surgically plans and assists with complicated procedures for these subspecialty cases: ○ Acetabular fracture

	○ Clavicle fracture ○ Hindfoot fracture ○ Midfoot dislocation ○ Midfoot fracture ○ Nonunion/malunion fracture in the lower extremity ○ Nonunion/malunion in the upper extremity ○ Pelvis dislocation ○ Pelvis fracture ○ Proximal humerus fracture ○ Proximal radius/ulna fracture ○ Tibial pilon fracture
Level 5 *Independently plans and performs complex procedures, including management of peri-operative complications*	● Independently applies multiplanar external fixator and understands principle of bone transport ● Performs surgical approach, reduction and fixation of pelvic/acetabular fractures or vertebral fractures with neurological deficit ● Demonstrates competence in percutaneous fixation of fractures, without assistance ● Capable of managing combined injuries (e.g., femoral neck and shaft) ● Develops and executes a plan for surgical management of early loss of fixation
Independently performs critical steps of complex procedures	● Identifies and appropriately manages complex intra-operative complications (e.g., screw penetration, loss of reduction, periprosthetic fracture) ● Identifies and properly manages associated ligamentous injuries (syndesmosis, collateral ligament) in delayed presentation/reconstruction ● Independently uses advanced reduction techniques (blocking screws, distraction devices, push/pull) ● Executes staged reconstruction for unsalvageable post-operative infection ● Executes a plan for management of nonunion fractures, including revision internal fixation and the use of bone graft ● Performs amputation in the setting of non-salvageable limb
Develops a plan an implements treatment of complex complications	● Independently performs all core procedures listed in Level 4 ● Surgically plans and independently performs complicated procedures for subspecialty cases as listed in Level 4
Assessment Models or Tools	● American Board of Orthopaedic Surgery (ABOS) Surgical Skills Assessment Tools for Core Procedures (Level 3) and Complicated Procedures (Level 4) ● Direct observation; procedural 360-degree evaluations ● Multisource feedback

	● O Score (link in resources) ● Zwisch scale (link in resources)
Curriculum Mapping	●
Notes or Resources	● American College of Surgeons. The language of progressive autonomy: Using the Zwisch scale for more than just assessment. https://www.facs.org/Education/Division-of-Education/Publications/RISE/articles/zwisch. 2021. ● Bonnaig N, Dailey S, Archdeacon M. Proper patient positioning and complication prevention in orthopaedic surgery. *J Bone Joint Surg Am*. 2014;96:1135-1140. https://pubmed.ncbi.nlm.nih.gov/24990979/. 2021. ● Gofton WT, Dudek NL, Wood TJ, Balaa F, Hamstra SJ. The Ottawa Surgical Competency Operating Room Evaluation (O-SCORE): a tool to assess surgical competence. *Acad Med*. 2012;87(10):1401-1407. https://pubmed.ncbi.nlm.nih.gov/22914526/. 2021. ● Noordin S, McEwen JA, Kragh JF, Aiesen E, Masri BA. Surgical tourniquets in orthopaedics. *J Bone Joint Surg Am*. 2009;91A(12):2958-2967. https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1017&context=pakistan_fhs_mc_surg_orthop. 2021. ● Operating room standards list/safe fluoroscopy list ● Textbook chapter for pre-operative planning

Patient Care 2: Operative Management of Soft Tissue Pathology **Overall Intent:** To perform core procedures for soft tissue pathology, including development of an operative plan and managing complications	
Milestones	**Examples**
Level 1 *Develops a simple surgical plan, with assistance* *Demonstrates basic surgical skills (e.g., wound closure) and assists with procedures* *Identifies and reports simple complications*	● Assesses patient for nerve entrapment and develops plan for simple carpal tunnel based on electromyography, with assistance ● Closes skin of simple incision with appropriate precision and tissue handling using the appropriate soft tissue forceps ● Identifies wound dehiscence during wound check and reports appropriately
Level 2 *Independently develops a simple surgical plan* *Performs surgical approach, with minimal assistance* *Manages simple complications*	● Develops plan for simple carpal tunnel based on electromyography to include tourniquet use and pat positioning and post-operative rehab ● Performs the simple surgical release of primary carpal tunnel release ● Identifies wound dehiscence with infection that would include local wound care, a decision about antibiotics, and assesses the need for surgical debridement and repeat closure ● Plans core procedures listed in Level 3 ● Performs surgical approach core procedures listed in Level 3
Level 3 *Independently develops a surgical plan for core procedures that includes identification of potential challenges and technical complexities* *Performs critical steps of core procedures, with assistance* *Identifies complex complications*	● Develops plan for carpal tunnel that includes other nerve entrapments and possible triggers in diabetic patient with complicated medical problems, including post-operative rehabilitation ● Performs carpal tunnel release independently ● Identifies wound dehiscence in a diabetic patient that requires a return to the operating room ● Performs critical steps of core procedures in: ○ Achilles tendon repair ○ Carpal tunnel release ○ Patellar tendon repair

	○ Quadriceps tendon repair ○ Trigger finger release
Level 4 *Independently develops a surgical plan for complex procedures, including contingencies for complications* *Independently performs core procedures; performs complex procedures, with assistance* *Develops a plan for managing complex complications*	● Develops plan for concomitant cubital tunnel and carpal tunnel syndrome to include contingencies for wound coverage ● Performs nerve entrapment surgery for cubital tunnel with intra-operative assessment for possible transposition, with assistance ● Identifies large wound dehiscence with infection; develops a plan that includes debridement of infected tissue and role of antibiotics ● Recognizes patient failure to appropriately progress with evaluation for complex regional pain syndrome and intervention with rehabilitation ● Independently performs all core procedures listed in Level 3 ● Surgically plans and assists with complicated procedures for these subspecialty cases: ○ Ankle/foot ligament repair/reconstruction ○ Ankle/foot tendon repair ○ Benign soft tissue resection ○ Distal biceps tendon repair ○ Rotator cuff open repair ○ Ulnar collateral ligament repair/reconstruction ○ Ulnar nerve decompression ○ Wrist/hand ligament repair/reconstruction
Level 5 *Independently plans and performs complex procedures, including management of peri-operative complications*	● Independently develops plan for tendon transfers for failed nerve return decompression ● Independently identifies large wound dehiscence with infection and performs debridement of infected tissue; discusses role of antibiotics and coordinates plastic surgery consultation ● Independently performs all core procedures listed in Level 4 ● Surgically plans and independently performs complicated procedures for subspecialty cases as listed in Level 4
Assessment Models or Tools	● ABOS Surgical Skills Assessment Tools for Core Procedures (Level 3) and Complicated Procedures (Level 4) ● Direct observation; procedural 360-degree evaluations ● Multisource feedback. ● O Score (link in resources)

	● Zwisch scale (link in resources)
Curriculum Mapping	●
Notes or Resources	● American College of Surgeons. The language of progressive autonomy: Using the Zwisch scale for more than just assessment. https://www.facs.org/Education/Division-of-Education/Publications/RISE/articles/zwisch. 2021. ● Bonnaig N, Dailey S, Archdeacon M. Proper patient positioning and complication prevention in orthopaedic surgery. *J Bone Joint Surg Am*. 2014;96:1135-1140. https://pubmed.ncbi.nlm.nih.gov/24990979/. 2021. ● Gofton WT, Dudek NL, Wood TJ, Balaa F, Hamstra SJ. The Ottawa Surgical Competency Operating Room Evaluation (O-SCORE): a tool to assess surgical competence. *Acad Med*. 2012;87(10):1401-1407. https://pubmed.ncbi.nlm.nih.gov/22914526/. 2021. ● Noordin S, McEwen JA, Kragh JF, Aiesen E, Masri BA. Surgical tourniquets in orthopaedics. *J Bone Joint Surg Am*. 2009;91A(12):2958-2967. https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1017&context=pakistan_fhs_mc_surg_orthop. 2021. ● Operating room standards list/safe fluoroscopy list ● Textbook chapter for pre-operative planning

Patient Care 3: Operative Management of Degenerative, Infectious, and Neoplastic Conditions **Overall Intent:** To perform core procedures for degenerative, infectious, and neoplastic conditions, including development of an operative plan and managing complications	
Milestones	**Examples**
Level 1 *Develops a simple surgical plan, with assistance* *Demonstrates basic surgical skills (e.g., wound closure) and assists with procedures* *Identifies and reports simple complications*	● With more senior resident supervision, develops a reconstruction plan such as total hip replacement for hip osteoarthritis ● Closes wound with appropriate precision and tissue handling ● Identifies wound dehiscence during wound check and reports appropriately
Level 2 *Independently develops a simple surgical plan* *Performs surgical approach, with minimal assistance* *Manages simple complications*	● Develops a reconstruction plan such as total hip replacement for hip osteoarthritis that includes patient positioning, surgical approach as appropriate for patient, and post-operative rehabilitation plans ● Performs the surgical approach for a total hip replacement ● Identifies wound dehiscence at post-operative appointment and presents a treatment course including local wound care, a decision about antibiotics and assesses the need for surgical debridement ● Plans core procedures listed in Level 3 ● Performs surgical approach core procedures listed in Level 3
Level 3 *Independently develops a surgical plan for core procedures that includes identification of potential challenges and technical complexities* *Performs critical steps of core procedures, with assistance* *Identifies complex complications*	● Develops a reconstruction plan such as total hip replacement for hip osteoarthritis that includes different surgical approaches, templating of the reconstruction including alternative implants; includes a plan for post-operative care including pain management, weight bearing, and rehabilitation ● Performs the bony cuts, trials, cementing, and implantation ● Identifies post-operative complications requiring operative revision such as periprosthetic fractures or dislocation, and develops a plan with appropriate recommendations for return to the operating room

	● Performs critical steps of core procedures in: ○ Below knee amputation ○ Primary total hip arthroplasty ○ Primary total knee arthroplasty ○ Spine exposure
Level 4 *Independently develops a surgical plan for complex procedures, including contingencies for complications* *Independently performs core procedures; performs complex procedures, with assistance* *Develops a plan for managing complex complications*	● Develops plan for reconstruction of hip osteoarthritis with congenital or degenerative deformity as well as contingency plans for alternative fixation and replacement techniques; anticipates wound complications, plans incisions to minimize ● Independently performs total hip replacement without assistance ● Performs total hip replacement for hip arthritis with congenital or degenerative deformity using appropriate soft tissue balancing, implant positioning, and choice of implants with assistance of attending ● Identifies prosthetic hip infection; develops a plan that includes debridement of infected tissue, an exchange of poly and or implant, role of antibiotics, and plastic surgery consultation ● Independently performs all core procedures listed in Level 3 ● Surgically plans and assists with complicated procedures for subspecialty cases as listed below: ○ **Neoplastic/infectious** ○ Benign bone tumor curettage and grafting ○ Benign soft tissue resection ○ Biopsy of bone lesion ○ Biopsy of soft tissue lesion ○ **Degenerative** ○ Ankle fusion ○ Bunion correction ○ Discectomy ○ Laminectomy ○ Metatarsal phalangeal fusion, great toe ○ Midfoot fusion ○ Multi-level spine fusion ○ Reverse shoulder arthroplasty ○ Revision total hip arthroplasty

	○ Revision total knee arthroplasty ○ Shoulder hemiarthroplasty ○ Single-level spine fusion ○ Spinal decompression ○ Subtalar fusion ○ Total shoulder arthroplasty ○ Wrist/hand bone procedure (e.g., fusion, excision)
Level 5 *Independently plans and performs complex procedures, including management of peri-operative complications*	● Develops a plan for reconstruction of the hip joint that is appropriately tailored to complex indications such as metastatic cancer, pelvic discontinuity, or severe dysplasia ● Independently performs revision total hip replacement ● Adapts implant choices, alterations of leg length/offset, and surgical approaches to the indications for revision total hip arthroplasty as well as the needs of the individual patient ● Identifies intra-operative periprosthetic fractures and can perform appropriate fixation ● Independently performs all core procedures listed in Level 4 ● Surgically plans and independently performs complicated procedures for subspecialty cases as listed in Level 4
Assessment Models or Tools	● ABOS Surgical Skills Assessment Tools for Core Procedures (Level 3) and Complicated Procedures (Level 4) ● Direct observation; procedural 360-degree evaluations ● Multisource feedback ● O Score (link in resources) ● Zwisch scale (link in resources)
Curriculum Mapping	●
Notes or Resources	● American College of Surgeons. The language of progressive autonomy: Using the Zwisch scale for more than just assessment. https://www.facs.org/Education/Division-of-Education/Publications/RISE/articles/zwisch. 2021. ● Bonnaig N, Dailey S, Archdeacon M. Proper patient positioning and complication prevention in orthopaedic surgery. *J Bone Joint Surg Am*. 2014;96:1135-1140. https://pubmed.ncbi.nlm.nih.gov/24990979/. 2021. ● Gofton WT, Dudek NL, Wood TJ, Balaa F, Hamstra SJ. The Ottawa Surgical Competency Operating Room Evaluation (O-SCORE): a tool to assess surgical competence. *Acad Med*. 2012;87(10):1401-1407. https://pubmed.ncbi.nlm.nih.gov/22914526/. 2021. ● Noordin S, McEwen JA, Kragh JF, Aiesen E, Masri BA. Surgical tourniquets in orthopaedics. *J Bone Joint Surg Am*. 2009;91A(12):2958-2967.

	https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1017&context=pakistan_fhs_mc_surg_orthop. 2021. ● Operating room standards list/safe fluoroscopy list ● Textbook chapter for preoperative planning

Patient Care 4: Operative Management of Arthroscopically Treated Conditions **Overall Intent:** To perform core arthroscopic procedures including development of an operative plan and managing complications	
Milestones	**Examples**
Level 1 *Develops a simple surgical plan, with assistance*	● With the chief resident develops a plan for arthroscopic management of a knee injury with meniscal pathology, including diagnosis and treatment options
Demonstrates basic surgical skills (e.g., wound closure) and assists with procedures	● Describes knee arthroscopy portals and arthroscopic equipment
Identifies and reports simple complications	● Identifies surgical wound infections or post-operative septic joint during wound check and reports appropriately
Level 2 *Independently develops a simple surgical plan*	● Develops surgical plan for knee arthroscopy including meniscectomy versus meniscal repair independently and includes all steps including patient positioning, assessment of the arthroscopic findings, and post-op rehabilitation plans ● Develops an arthroscopic plan for meniscectomy independently and includes all steps, patient positioning, arthroscopic instruments, and post-operative plans
Performs surgical approach, with minimal assistance	● Performs the diagnostic knee arthroscopy with appropriate inspection of all compartments and probing of structures including all compartments of the knee and portal placement ● Performs arthroscopic portal placement and camera insertion for meniscectomy with awareness to protect articular cartilage during insertion of camera
Manages simple complications	● Identifies wound infection at post-operative appointment and presents a treatment course that would include local wound care, a decision about antibiotics and assesses the need for surgical debridement ● Identifies portal incision compromise at post-operative appointment and presents a treatment plan including local wound care, cultures, a decision about antibiotics and possible joint sepsis requiring surgical lavage and debridement ● Plans core procedures listed in Level 3 ● Performs surgical approach core procedures listed in Level 3
Level 3 *Independently develops a surgical plan for core procedures that includes identification of potential challenges and technical complexities*	● Develops a plan for knee arthroscopy with meniscectomy versus meniscal repair including location of tear, size of tear, equipment needed for repair with plans for steps of both procedures

Performs critical steps of core procedures, with assistance *Identifies complex complications*	● Includes a plan for post-operative care including immobilization, weight bearing, and rehabilitation ● Performs the diagnostic knee arthroscopy including portal placement; assesses meniscal pathology to determine treatment choice, performs simple meniscectomy ● Performs meniscectomy after probing and efficient use of basket forceps and shaver ● Identifies complications from meniscectomy and changes needed for post-operative rehabilitation ● Identifies red zone injury or meniscal root injury for potential repair and appropriate recommendations, and performs critical steps of core meniscectomy procedure ● Performs critical steps of core procedures in: ○ Anterior cruciate ligament (ACL) reconstruction ○ Arthroscopic meniscectomy ○ Simple shoulder arthroscopy (e.g., debridement, subacromial decompression)
Level 4 *Independently develops a surgical plan for complex procedures, including contingencies for complications* *Independently performs core procedures; performs complex procedures, with assistance* *Develops a plan for managing complex complications*	● Develops plans for surgical treatment of meniscal pathology in association with other knee pathology including single or multi-ligament knee injury with tearing medial and lateral menisci and correlates the need for potential meniscectomy versus repair ● Plans and performs approach to multi-ligament knee reconstruction with assistance of attending ● Independently performs diagnostic arthroscopy, meniscectomy, and ACL reconstruction ● Identifies large wound dehiscence with infection; develops a plan including debridement of infected tissue, the role of antibiotics, and a plastic surgery consultation ● Identifies potential surgical site infection, and develops a plan for arthroscopic lavage, synovectomy, and appropriate antibiotics with infectious diseases consult; correlates suspected deep-vein thrombosis (DVT) with appropriate studies and treatments ● Independently performs all core procedures listed in Level 3 ● Surgically plans and assists with complicated procedures for subspecialty cases as listed below: ○ Advanced shoulder arthroscopy (e.g., capsulorrhaphy, labral repair) ○ Ankle arthroscopy ○ Hip arthroscopy

	○ Lateral collateral ligament (LCL)/medial collateral ligament (MCL), posterior cruciate ligament (PCL) repair/reconstruction ○ Meniscal repair ○ Rotator cuff arthroscopic repair
Level 5 *Independently plans and performs complex procedures, including management of peri-operative complications*	● Independently plans and performs multi-ligament knee injury surgical treatment ● Performs meniscoplasty and root repair ● Identifies large wound dehiscence with infection and can perform debridement of infected tissue, identify role of antibiotics, and coordinates infectious disease consultation ● Identifies and performs arthroscopic debridement of septic knee post-meniscectomy, arranges infectious disease consult for antibiotic coverage ● Independently performs all core procedures listed in Level 4 ● Surgically plans and independently performs complicated procedures for subspecialty cases as listed in Level 4
Assessment Models or Tools	● ABOS Surgical Skills Assessment Tools for Core Procedures (Level 3) and Complicated Procedures (Level 4) ● Direct observation; procedural 360-degree evaluations ● Multisource feedback ● O Score (link in resources) ● Zwisch scale (link in resources)
Curriculum Mapping	●
Notes or Resources	● American College of Surgeons. The language of progressive autonomy: Using the Zwisch scale for more than just assessment. https://www.facs.org/Education/Division-of-Education/Publications/RISE/articles/zwisch. 2021. ● Bonnaig N, Dailey S, Archdeacon M. Proper patient positioning and complication prevention in orthopaedic surgery. *J Bone Joint Surg Am*. 2014;96:1135-1140. https://pubmed.ncbi.nlm.nih.gov/24990979/. 2021. ● Gofton WT, Dudek NL, Wood TJ, Balaa F, Hamstra SJ. The Ottawa Surgical Competency Operating Room Evaluation (O-SCORE): a tool to assess surgical competence. *Acad Med*. 2012;87(10):1401-1407. https://pubmed.ncbi.nlm.nih.gov/22914526/. 2021. ● Noordin S, McEwen JA, Kragh JF, Aiesen E, Masri BA. Surgical tourniquets in orthopaedics. *J Bone Joint Surg Am*. 2009;91A(12):2958-2967. https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1017&context=pakistan_fhs_mc_surg_orthop. 2021. ● Operating room standards list/safe fluoroscopy list

	● Textbook chapter for pre-operative planning

Patient Care 5: Operative Management of Pediatric Conditions **Overall Intent:** To perform core pediatric procedures including development of an operative plan and managing complications	
Milestones	**Examples**
Level 1 *Develops a simple surgical plan, with assistance*	● With the chief resident, develops a treatment plan that decides between closed versus open treatment of a mid-diaphyseal femur fracture
Demonstrates basic surgical skills (e.g., wound closure) and assists with procedures	● Closes wound with appropriate precision and tissue handling ● Appropriately positions and preps and drapes patient for routine procedures
Identifies and reports simple complications	● Identifies post-operative nerve palsy and reports appropriately ● Identifies wound dehiscence during wound check and reports appropriately
Level 2 *Independently develops a simple surgical plan*	● Develops a surgical fixation plan for a simple transverse mid-diaphyseal femur fracture independently and includes all steps including patient positioning, recognizes fracture patterns that may lead to a more complex procedure, and post-operative rehabilitation including weight-bearing status and need for immobilization
Performs surgical approach, with minimal assistance	● Performs the surgical approach for flexible intramedullary nail fixation and recognizes the need for additional fracture reduction during the procedure
Manages simple complications	● Identifies post-operative nerve palsy and recommends changes in post-operative rehabilitation plans ● Identifies wound dehiscence at post-operative appointment and presents a treatment course that would include local wound care, a decision about antibiotics, and assess the need for surgical debridement and repeat closure ● Plans core procedures listed in Level 3 ● Performs surgical approach core procedures listed in Level 3
Level 3 *Independently develops a surgical plan for core procedures that includes identification of potential challenges and technical complexities*	● Develops a comprehensive plan for fixation of a comminuted mid-diaphyseal femur fracture with templating of the fracture fixation choices including alternative implants, if needed; includes a plan for post-operative care including immobilization, weight bearing, and rehabilitation
Performs critical steps of core procedures, with assistance	● Performs the minimally invasive approach for lateral entry intramedullary nail fixation, fracture reduction, and implant placement with safe and efficient use of fluoroscopy ● Positions, preps, and drapes patient with a femoral shaft fracture on a fracture operating room table for intramedullary femoral nail insertion

Identifies complex complications	● Identifies deep wound infection and recommends treatment including return to the operating room for debridement ● Recognizes failure of fixation and develops a plan for revision fixation with assistance ● Performs critical steps of core procedures in: ○ Ankle/distal tibia fracture ○ Excision of small benign soft tissue mass ○ Manipulation and splinting of simple two-bone forearm fracture
Level 4 *Independently develops a surgical plan for complex procedures, including contingencies for complications* *Independently performs core procedures; performs complex procedures, with assistance* *Develops a plan for managing complex complications*	● Application of hip spica cast ● Develops plan for minimally invasive plate fixation of highly comminuted mid-diaphyseal femur fracture and contingency plans for alternative fixation techniques; plans the use of reduction aids such as the F-tool or need for open reduction; anticipates wound complications and plans incisions to minimize devascularization of fracture fragments ● Independently performs minimally invasive plate fixation of a comminuted femur fracture without assistance ● Identifies deep infection; develops a plan that includes debridement of infected tissue and the role of antibiotics ● Recognizes failure of fixation, independently develops plan for revision of the fixation and performs revision surgery with assistance ● Independently performs all core procedures listed in Level 3 ● Surgically plans and assists with complicated procedures for subspecialty cases as listed below: ○ Ankle tendon lengthening ○ Epiphysiodesis ○ Femoral osteotomy ○ Hip arthrotomy/drainage ○ Hip tendon lengthening ○ Knee tendon lengthening ○ Pelvic osteotomy ○ Slipped capital femoral epiphysis
Level 5 *Independently plans and performs complex procedures, including management of peri-operative complications*	● Independently performs revision surgery for failed fixation after treatment of mid-diaphyseal femur fracture

	● Identifies deep infection; develops and carries out a comprehensive treatment plan including performing debridement of infected tissue, identifying role of antibiotics, and coordinating consultations, as needed ● Independently performs all core procedures listed in Level 4 ● Surgically plans and independently performs complicated procedures for subspecialty cases as listed in Level 4
Assessment Models or Tools	● ABOS Surgical Skills Assessment Tools for Core Procedures (Level 3) and Complicated Procedures (Level 4) ● Direct observation; procedural 360-degree evaluations ● Multisource feedback ● O Score (link in resources) ● Zwisch scale (link in resources)
Curriculum Mapping	●
Notes or Resources	● American College of Surgeons. The language of progressive autonomy: Using the Zwisch scale for more than just assessment. https://www.facs.org/Education/Division-of-Education/Publications/RISE/articles/zwisch. 2021. ● Bonnaig N, Dailey S, Archdeacon M. Proper patient positioning and complication prevention in orthopaedic surgery. *J Bone Joint Surg Am*. 2014;96:1135-1140. https://pubmed.ncbi.nlm.nih.gov/24990979/. 2021. ● Gofton WT, Dudek NL, Wood TJ, Balaa F, Hamstra SJ. The Ottawa Surgical Competency Operating Room Evaluation (O-SCORE): a tool to assess surgical competence. *Acad Med*. 2012;87(10):1401-1407. https://pubmed.ncbi.nlm.nih.gov/22914526/. 2021. ● Noordin S, McEwen JA, Kragh JF, Aiesen E, Masri BA. Surgical tourniquets in orthopaedics. *J Bone Joint Surg Am*. 2009;91A(12):2958-2967. https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1017&context=pakistan_fhs_mc_surg_orthop. 2021. ● Operating room standards list/safe fluoroscopy list ● Textbook chapter for pre-operative planning

Patient Care 6: Evaluation and Management of the Adult Orthopaedic Patient **Overall Intent:** To evaluate and manage a patient with operative and non-operative orthopaedic conditions	
Milestones	**Examples**
Level 1 *Obtains a patient history, performs a physical examination and develops a differential diagnosis for patients across clinical settings*	● Demonstrates a basic triage musculoskeletal exam in an orthopaedic patient
Manages patients with straightforward conditions, with direct supervision (e.g., fracture, arthritis)	● Appropriately assesses, coordinates, and initiates care for a fall patient with a wrist fracture including stabilization
Recognizes and initiates work-up of emergent conditions (e.g. compartment syndrome, dysvascular limb, cauda equina syndrome)	● Understands common complications from a fractured wrist (e.g., acute carpal tunnel syndrome, associated scapholunate ligament injuries, edema blisters, compartment syndrome)
Level 2 *Orders and interprets diagnostic testing and consultations based on patient evaluation*	● Orders appropriate testing (e.g., x-rays for a wrist fracture by clinical exam; can apply a Frykman classification and arrange care)
Manages patients with straightforward conditions, with indirect supervision	● Arranges coordination of care plan for a Colles fracture patient (e.g., obtains permit, sedation, and radiographic c-arm, and splinting for an emergency room patient)
Formulates and executes a stabilization plan for emergent conditions	● Diagnoses and coordinates care (e.g., for acute carpal tunnel in a wrist fracture patient includes, explains situation, obtains permit, coordinates surgical intervention, and post-operative care*)*
Level 3 *Synthesizes a plan to manage healthy patients with straightforward conditions, including operative and non-operative options*	● Correlates a plan for acute back pain following injury including diagnostic testing, nonsteroidal anti-inflammatory drugs (NSAIDS), physical therapy, pain modification strategies, and follow-up evaluations
Independently manages patients and adapts management plan for changing clinical situation	● Correlates magnetic resonance imaging (MRI) findings for a herniated disc to physical exam findings, and institutes pain management plans for radicular pain
Triages management of multiple emergent conditions	● Arranges radiographic studies that correlate with acute cauda equina syndrome (e.g., on a motor vehicle accident physical exam, notifies spine team and arranges surgical care)
Level 4 *Synthesizes a comprehensive plan to manage patients with complex conditions and comorbidities*	● Coordinates a medical/ surgical care of a septic total knee arthroplasty (e.g., with a urinary tract infection, diabetes mellitus, or obesity)

Leads an orthopaedic team in the management of patients with complex conditions (e.g., periprosthetic femur fractures in the setting of osteoporosis and medical comorbidities, complex elbow instability in the obese patient) *Leads an orthopaedic team in the management of emergent conditions (e.g., polytrauma)*	● Arranges consults for infectious disease, hospitalist, and other disciplines as needed for multi-system disease failure in a septicemia and multi-infected joint patient ● Coordinates available care for a motor vehicle accident patient with pelvis, long bone, and abdominal injuries, including initial fracture stabilization, interventional radiology for selective embolization and monitoring labs for blood loss, second hits, and clinical exams for limb compromise
Level 5 *Develops a clinical pathway or guideline for the management of patients based on demonstrated clinical expertise* *Leads a multidisciplinary team in the management of patients with complex conditions*	● Executes a fragility fracture patient care pathway for post hospital care (e.g., screening for osteoporosis includes, labs, bone density, medication initiation, fall preventive therapy, and home modifications and family support)
Assessment Models or Tools	● Direct observation ● Multisource feedback
Curriculum Mapping	●
Notes or Resources	● Bonnaig N, Dailey S, Archdeacon M. Proper patient positioning and complication prevention in orthopaedic surgery. *J Bone Joint Surg Am*. 2014;96:1135-1140. https://pubmed.ncbi.nlm.nih.gov/24990979/. 2021. ● Noordin S, McEwen JA, Kragh JF, Aiesen E, Masri BA. Surgical tourniquets in orthopaedics. *J Bone Joint Surg Am*. 2009;91A(12):2958-2967. https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1017&context=pakistan_fhs_mc_surg_orthop. 2021. ● Operating room standards list/safe fluoroscopy list ● Textbook chapter for preoperative planning

Patient Care 7: Evaluation and Management of the Pediatric Orthopaedic Patient **Overall Intent:** To evaluate and manage a pediatric patient with operative and non-operative orthopaedic conditions	
Milestones	**Examples**
Level 1 *Obtains a patient history, performs a physical examination and develops a differential diagnosis for patients across clinical settings*	● Demonstrates a basic musculoskeletal exam in a pediatric orthopaedic patient in a with elbow pain after a fall
Manages patients with straightforward conditions, with direct supervision (e.g., fracture, arthritis)	● Appropriately assesses, coordinates and initiates care for a pediatric patient with a nondisplaced supracondylar humerus fracture
Recognizes and initiates work-up of emergent conditions (e.g. compartment syndrome, dysvascular limb, cauda equina syndrome)	● Recognizes common emergent conditions from a supracondylar humerus fracture (e.g., neurological and vascular compromise, compartment syndrome)
Level 2 *Orders and interprets diagnostic testing and consultations based on patient evaluation*	● Orders appropriate testing (e.g., x-rays for an elbow injury fracture by clinical exam and can accurately describe the radiographic findings)
Manages patients with straightforward conditions, with indirect supervision	● Coordination of care plan for a patient with a supracondylar humerus fractur that includes immobilizing the arm that does not require a reduction; recommends appropriate next steps that includes timely follow-up
Formulates and executes a stabilization plan for emergent conditions	● Recognizes a dysvascular limb and knows how to position the arm to attempt to improve perfusion
Level 3 *Synthesizes a plan to manage healthy patients with straightforward conditions, including operative and non-operative options*	● Understand the criteria used to recommend operative or non-operative treatment for a Type II supracondylar humerus fracture
Independently manages patients and adapts management plan for changing clinical situation	● Recognizes fracture fragment displacement on follow-up imaging and develops plan that includes decision making about the next steps in treatment (i.e., conversion from non-operative to operative treatment)
Triages management of multiple emergent conditions	● Evaluates a child with multiple injuries and prioritizes next steps in evaluation and management, e.g., a child with a supracondylar humerus fracture with evolving compartment syndrome and a shortened, diaphyseal femur fracture

Level 4 *Synthesizes a comprehensive plan to manage patients with complex conditions and comorbidities* *Leads an orthopaedic team in the management of patients with complex conditions (e.g., persistent spine infection after pedicle screw instrumentation in a malnourished patient)* *Leads an orthopaedic team in the management of emergent conditions (e.g., polytrauma)*	● Coordinates a medical/surgical care of a pediatric femur fracture in a patient with cerebral palsy and respiratory compromise ● Arranges consults for pediatric hospitalists, pulmonology, respiratory therapy, and physical therapy as needed for a pediatric patient with a femur fracture, cerebral palsy, and respiratory compromise ● Coordinates care for a pediatric patient with pelvis, long bone, and abdominal injuries, including initial fracture stabilization, monitoring for compartment syndrome, and monitoring labs for blood loss, second hits, and clinical exams for limb compromise
Level 5 *Develops a clinical pathway or guideline for the management of patients based on demonstrated clinical expertise* *Leads a multidisciplinary team in the management of patients with complex conditions*	● Develops a patient care pathway for the hospital care in the setting of scoliosis surgery (e.g., labs, pain management, physical therapy, home modifications, and family support) ● Leads the multidisciplinary team's care of a pediatric patient with a femur fracture, cerebral palsy and respiratory compromise that includes consulting pediatricians, pulmonology, respiratory therapy, and physical therapy
Assessment Models or Tools	● Direct observation ● Multisource feedback
Curriculum Mapping	●
Notes or Resources	● Bonnaig N, Dailey S, Archdeacon M. Proper patient positioning and complication prevention in orthopaedic surgery. *J Bone Joint Surg Am*. 2014;96:1135-1140. https://pubmed.ncbi.nlm.nih.gov/24990979/. 2021. ● Noordin S, McEwen JA, Kragh JF, Aiesen E, Masri BA. Surgical tourniquets in orthopaedics. *J Bone Joint Surg Am*. 2009;91A(12):2958-2967. https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1017&context=pakistan_fhs_mc_surg_orthop. 2021. ● Operating Room standards list/safe fluoro list ● Textbook chapter for pre-operative planning

Medical Knowledge 1: Orthopaedic Clinical Reasoning and Decision Making **Overall Intent:** To analyze and synthesize medical knowledge to apply critical reasoning to clinical decision making, appropriately prioritizing diagnoses and using diagnostic tests	
Milestones	**Examples**
Level 1 *Articulates a methodology for clinical reasoning* *Identifies resources to direct clinical decisions*	● Presents a patient complaining of knee pain, including relevant musculoskeletal symptoms and activity history after interviewing the patient ● Investigates medical record for ancillary treatments including physical and/or occupational therapies, bracing, injections ● Orders appropriate basic imaging studies for the involved knee
Level 2 *Demonstrates clinical reasoning to determine treatment goals* *Selects and prioritizes relevant resources based on scenario to inform decisions*	● Prioritizes common-to-rare differential diagnoses for knee pain relevant to patient history ● Interprets plain radiographs to determine presence of acute and/or chronic conditions ● Relates the potential findings seen on plain radiographs (e.g., fracture, subchondral sclerosis, malalignment) ● Orders indicated advanced imaging studies and relates the potential findings noted on MRI for an ACL injury ● Applies the appropriate use criteria to an individual patient
Level 3 *Synthesizes information to make clinical decisions for straightforward conditions* *Integrates evidence-based information to inform diagnostic decision making for straightforward conditions*	● Prioritizes a broad differential diagnosis for the presentation of knee pain to include hip and spine pathology, infection, and inflammatory etiologies ● Orders appropriate adjunct plain radiographs (e.g., hip, hip-to-knee, weight bearing) to inform comprehensive diagnosis ● Describes the appropriate clinical practice guidelines to guide non-operative and surgical decision making for knee pathology ● Uses the clinical and radiological findings to make a preliminary diagnosis of ligamentous knee injury and a preliminary treatment plan
Level 4 *Efficiently synthesizes information and integrates reflection to make clinical decisions for complex conditions* *Integrates evidence-based information to inform diagnostic decision making for complex conditions*	● Adjusts surgical plan to incorporate treatment of malalignment and chondral, meniscal injuries ● Considers patient factors in timing and reconstruction options for an ACL injury ● Incorporates clinical practice guidelines into clinical/radiologic findings to develop a comprehensive surgical and rehabilitation plan ● Uses current evidence and other resources to decide most appropriate ACL graft
Level 5 *Incorporates clinical reasoning to improve care pathways*	● Demonstrates knowledge of the interlinked effects of biologic materials, surgical treatment and rehabilitation protocols and applies them to appropriate patient populations and specific patient needs

	● Understands the methodology for applying appropriate use criteria
Assessment Models or Tools	● Case-based discussions ● Multisource feedback ● Medical record (chart) audit ● Preceptor encounters ● Reflection
Curriculum Mapping	●
Notes or Resources	● Croskerry P. Achieving quality in clinical decision making: Cognitive strategies and detection of bias. *Academic Emergency Medicine*. 2002;9(11):1184-1204. https://onlinelibrary.wiley.com/doi/abs/10.1197/aemj.9.11.1184?sid=nlm%3Apubmed. 2021. ● Hedrick TL, Young JS. The use of "war games"' to enhance high-risk clinical decision-making in students and residents. *The American Journal of Surgery*. 2008;195(6):843-849. https://pubmed.ncbi.nlm.nih.gov/18440485/. 2021. ● Humbert AJ, Besinger B, Miech Ej. Assessing clinical reasoning skills in scenarios of uncertainty: convergent validity for a Script Concordance Test in an emergency medicine clerkship and residency. *Acad Emerg Med*. 2011;18(6):627-634. https://onlinelibrary.wiley.com/doi/full/10.1111/j.1553-2712.2011.01084.x. 2021. ● Norman GR, Monteiro SD, Sherbino J, Ilgen JS, Schmidt HG, Mamede S. The causes of errors in clinical reasoning: Cognitive biases, knowledge deficits, and dual process thinking. *Acad Med*. 2017;92(1):23-30. https://journals.lww.com/academicmedicine/Fulltext/2017/01000/The_Causes_of_Errors_in_Clinical_Reasoning_.13.aspx. 2021. ● Royce CS, Hayes MM, Schwartzstein RM. Teaching critical thinking: a case for instruction in cognitive biases to reduce diagnostic errors and improve patient safety. *Acad Med*. 2019;94(2):187-194. https://journals.lww.com/academicmedicine/Fulltext/2019/02000/Teaching_Critical_Thinking__A_Case_for_Instruction.20.aspx. 2021.

Medical Knowledge 2: Anatomy and Physiology of Musculoskeletal Conditions **Overall Intent:** To apply knowledge of pathoanatomy and pathophysiology to treatment options	
Milestones	**Examples**
Level 1 *Identifies anatomy and pathophysiology of straightforward conditions*	● Identifies basic rotator cuff anatomy muscle group, the acromion types, radiographic bony anatomy, and the corresponding association with impingement syndrome ● Identifies basic knee arthropathy causes, and correlates radiographic description findings
Level 2 *Demonstrates knowledge of pathoanatomy, disease classification systems, and natural history for straightforward conditions*	● Understands extrinsic causes, intrinsic supraspinatus degeneration, and the continuum of rotator cuff disease progression from bursitis to end stage cuff arthropathy ● Understands inflammatory and non-inflammatory knee arthropathy, and correlates radiographic classifications to physical findings
Level 3 *Applies knowledge of pathoanatomy and pathophysiology to explain the effects of surgical or non-surgical treatment on patient outcomes for straightforward conditions*	● Understands the conservative approach of NSAIDS, corticosteroid injections, and physical therapy on straightforward impingement syndrome, partial acute versus chronic rotator cuff tears versus arthroscopic subacromial treatment ● Uses conservative options such as Tylenol, NSAIDS, or other non-opioid medicines for relief, and uses physical therapy for strengthening and gait disturbance; understands the use of steroid articular injections as an anti-inflammatory effect and can correlate appropriate labs for inflammatory arthropathy differential diagnosis; correlates the radiographic findings, clinical exam with a primary total knee reconstruction plan
Level 4 *Applies comprehensive knowledge of pathoanatomy and pathophysiology to treatment options and patient outcomes for complex conditions*	● Understands bursal versus articular sided cuff tears, partial versus full-thickness insertional full-thickness tears, arthroscopic versus open repairs, post-operative shoulder rehabilitation, and the long-term outcome for rotator cuff repairs ● Understands types of wear, and various material wear characteristics, radiographic bony classification for wear and can correlate treatment options for bony structural defects ● Understands cuff progression treatments from conservative to end-stage, and progression of treatment options from physical therapy, arthroscopic and open repairs of tears, and superior capsular reconstructions, latissimus transfers, and reverse total shoulders options
Level 5 *Contributes to peer-reviewed literature on the varying patterns of disease presentation, natural history, and treatment options*	● Performs research and has complex understanding of the relationship between new technology and treatment knowledge for the advancement of shoulder and knee knowledge
Assessment Models or Tools	● Direct observation ● Radiographic and MRI interpretations
Curriculum Mapping	●
Notes or Resources	● Neer Impingement Test / Hawkins Test

Systems-Based Practice 1: Patient Safety and Quality Improvement (QI) **Overall Intent:** To engage in the analysis and management of patient safety events, including relevant communication with patients, families, and health care professionals; to conduct a QI project	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of common patient safety events* *Demonstrates knowledge of how to report patient safety events* *Demonstrates knowledge of basic quality improvement methodologies and metrics*	● Lists patient misidentification or medication errors as common patient safety events ● Identifies pain medication safety issues when cross referencing patient medications ● Reports lack of implementation of identifier (e.g., non-slip socks) or room door sign in geriatric patient population at risk for falls ● Describes how to report errors in the local clinical environment ● Knows the systems process for communicating potential medication errors ● Summarizes protocols resulting in fall reduction ● Summarizes common home issues to mitigate fall issues such as room carpets and grab bars
Level 2 *Identifies system factors that lead to patient safety events* *Reports patient safety events through institutional reporting systems (simulated or actual)* *Describes local quality improvement initiatives*	● Identifies geriatric patient characteristics contributing to fall risk ● Can correctly apply a Plan Do Study Act (PDSA) QI project to help eliminate narcotic dependency in a trauma-injured patient ● Describes root cause analysis process
Level 3 *Participates in analysis of patient safety events (simulated or actual)* *Participates in disclosure of patient safety events to patients and families (simulated or actual)* *Participates in local quality improvement initiatives*	● Prepares for morbidity and mortality (M and M) presentations ● Communicates, under supervision, with patients/families about a medication error ● Participates in protocol with risk management to disclose medication errors
Level 4 *Conducts analysis of patient safety events and offers error prevention strategies (simulated or actual)*	● Collaborates with a team to conduct the analysis of fall occurrences and can effectively communicate with patients/families about those events

Discloses patient safety events to patients and families (simulated or actual) *Demonstrates the skills required to identify, develop, implement, and analyze a quality improvement project*	● Participates in a QI project to decrease frequency of falls within the practice
Level 5 *Actively engages teams and processes to modify systems to prevent patient safety events* *Role models or mentors others in the disclosure of patient safety events* *Creates, implements, and assesses quality improvement initiatives at the institutional or community level*	● Assumes a leadership role at the departmental or institutional level for patient safety ● Conducts a simulation for disclosing patient safety events ● Recognizes the need for and completes a QI project to decrease fall risk in the geriatric population in collaboration with the county health department and shares results with stakeholders
Assessment Models or Tools	● Direct observation ● E-module multiple choice tests ● Hospital safety report audit ● Multisource feedback ● Presentations (M and M, QI) ● Reflection ● Simulation
Curriculum Mapping	●
Notes or Resources	● Institute of Healthcare Improvement. http://www.ihi.org/Pages/default.aspx. 2021.

Systems-Based Practice 2: System Navigation for Patient-Centered Care **Overall Intent:** To effectively navigate the health care system, including the interdisciplinary team and other care providers, to adapt care to a specific patient population to ensure high-quality patient outcomes	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of care coordination* *Identifies key elements for safe and effective transitions of care and hand-offs*	● Identifies the primary care provider for a geriatric patient with a hip fracture home health nurse, physical therapist, and social workers as members of the team ● Lists follow-up of labs, testing, new medications, and consults as essential components of a sign-out
Level 2 *Coordinates care of patients in routine clinical situations effectively using the roles of the interprofessional teams* *Performs safe and effective transitions of care/hand-offs in straightforward clinical situations*	● Coordinates transition of care with rehabilitation facility at the time of discharge from the hospital ● Uses a systematic institutional process during routine sign-out
Level 3 *Coordinates care of patients in complex clinical situations effectively using the roles of their interprofessional teams* *Performs safe and effective transitions of care/hand-offs in complex clinical situations*	● Coordinates complex care with the social worker for a homeless patient to ensure appropriate medical after-care ● Uses institutional protocol when transferring a complex patient to the intensive care unit (ICU)
Level 4 *Role models effective coordination of patient-centered care among multidisciplinary teams* *Role models and advocates for safe and effective transitions of care/hand-offs*	● Leads team members during inpatient rotations in appropriate consultation with care coordination in disposition of homeless patient with mobility impairment ● Plans for cross-coverage in case of unanticipated absence of a team member
Level 5 *Analyzes the process of care coordination and leads in the design and implementation of improvements* *Improves quality of transitions of care within and across health care delivery systems to optimize patient outcomes*	● Leads a community outreach program to design and implement a geriatric fall risk reduction plan ● Develops a protocol (care pathways for various orthopaedic conditions) to improve transitions to long-term care facilities
Assessment Models or Tools	● Direct observation ● Multisource feedback

	● Objective structured clinical examination (OSCE) ● Quality metrics and goals mined from electronic health records (EHR) ● Review of sign-out tools, use and review of checklists
Curriculum Mapping	●
Notes or Resources	● Centers for Disease Control. Population health training. https://www.cdc.gov/pophealthtraining/whatis.html. 2021. ● Hospitals in Pursuit of Excellence. Preventing Patient Falls: A Systematic Approach from the Joint Commission Center for Transforming Healthcare Project. http://www.hpoe.org/Reports-HPOE/2016/preventing-patient-falls.pdf. 2021. ● Skochelak SE, Hawkins RE, Lawson LE, Starr SR, Borkan JM, Gonzalo JD. *AMA Education Consortium: Health Systems Science*. 1st ed. Philadelphia, PA: Elsevier; 2016. https://commerce.ama-assn.org/store/ui/catalog/productDetail?product_id=prod2780003. 2021.

Systems-Based Practice 3: Physician Role in Health Care Systems **Overall Intent:** To understand the physician's role in the complex health care system and how to operate effectively within the system to improve patient care	
Milestones	**Examples**
Level 1 *Describes basic health payment systems, including government, private, public, and uninsured care as well as different practice models*	● Articulates the differences between home care, skilled nursing, and long-term care facilities ● Takes into consideration patient's prescription drug coverage when recommending medical treatment of osteoarthritis
Level 2 *Describes how working within the health care system impacts patient care, including billing and coding*	● Identifies coding requirements for clinical documentation ● Explains that improving patient satisfaction potentially improves patient compliance ● Recognizes that appropriate comorbidity documentation can influence the severity of illness determination upon discharge ● Understands the impact of health plan coverage on prescription drugs for individual patients
Level 3 *Analyzes how personal practice affects the system (e.g., length of stay, readmission rates, clinical efficiency)*	● Ensures compliance with care pathways to optimize length of stay ● Understands the role of patient education in decreasing readmission rates
Level 4 *Uses shared decision making in patient care, taking into consideration costs to the patient*	● Ensures proper documentation of qualifying hospital stay prior to discharging a patient to a skilled nursing facility for physical therapy ● Works collaboratively to improve patient assistance resources for a patient with a recent amputation and limited resources ● Tailors treatment decisions to patient resources/insurance status (e.g., prescribing a brace versus applying a splint)
Level 5 *Participates in advocacy activities for health policy*	● Works with community or professional organizations to advocate for playground equipment safety measures ● Improves informed consent process for non-English-speaking patients requiring interpreter services ● Performs clinical research that effects health care barriers
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Patient satisfaction data ● Portfolio
Curriculum Mapping	●
Notes or Resources	● Agency for Healthcare Research and Quality (AHRQ). Measuring the quality of physician care. https://www.ahrq.gov/talkingquality/measures/setting/physician/index.html. 2021. ● AHRQ. Major physician Measurement Sets. https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/physician/measurementsets.html. 2021.

	● Dzau VJ, McClellan MB, McGinnis JM, et al. Vital directions for health and health care: Priorities from a National Academy of Medicine initiative. *JAMA*. 2017;317(14):1461-1470. https://nam.edu/vital-directions-for-health-health-care-priorities-from-a-national-academy-of-medicine-initiative/. 2021. ● The Commonwealth Fund. Health system data center. http://datacenter.commonwealthfund.org/?_ga=2.110888517.1505146611.1495417431-1811932185.1495417431#ind=1/sc=1. 2021. ● The Kaiser Family Foundation. www.kff.org. 2021. ● The Kaiser Family Foundation. Health reform. https://www.kff.org/topic/health-reform/. 2021.

Practice-Based Learning and Improvement 1: Evidence-Based and Informed Practice **Overall Intent:** To incorporate evidence and patient values into clinical practice	
Milestones	**Examples**
Level 1 *Demonstrates how to access and use available evidence, and incorporate patient preferences and values in order to take care of a straightforward condition*	● Compares evidence-based guidelines and literature review for treatment of a femoral neck fracture to patient's preference for treatment while communicating and understanding options
Level 2 *Articulates clinical questions and elicits patient preferences and values in order to guide evidence-based care*	● Identifies and discusses potential evidence-based treatment options for a patient with a displaced femoral neck fracture and solicits patient perspective on activity level and needs
Level 3 *Locates and applies the best available evidence, integrated with patient preference, to the care of complex conditions*	● Obtains, discusses, and applies evidence for the treatment of a patient with a displaced femoral neck fracture and co-existing diabetes and coronary artery disease ● Understands and appropriately uses clinical practice guidelines in making patient care decisions while eliciting patient preferences for operative versus non-operative treatment
Level 4 *Critically appraises and applies evidence even in the face of uncertainty and conflicting evidence to guide care, tailored to the individual patient*	● Accesses the primary literature to identify alternative treatments for a displaced femoral neck fracture based on bone quality. (e.g., internal fixation versus cemented versus cementless hemiarthropalsty versus total hip arthroplasty)
Level 5 *Coaches others to critically appraise and apply evidence for complex conditions; and/or participates in the development of guidelines*	● Leads clinical discussion on application of evidence-based practice for treatment of displaced femoral neck fractures ● Develops a fall prevention pathway to reduce incidence of in-hospital falls as part of a multidisciplinary team
Assessment Models or Tools	● Core conference participation ● Direct observation ● Oral or written examinations ● Presentation evaluation
Curriculum Mapping	●
Notes or Resources	● AO Foundation surgery reference. (national organization guidelines, e.g., American Osteopathic Association, American Academy of Orthopaedic Surgeons) https://surgeryreference.aofoundation.org/orthopedic-trauma/adult-trauma/proximal-femur/femoral-neck-fracture-subcapital-displaced. 2021. ● Orthopaedic Trauma Association (OTA). Femoral neck fractures. https://ota.org/sites/files/2018-08/L02-Femoral%20Neck%20Fractures.pdf. 2021. ● Various journals (*Journal of the American Academy of Orthopaedic Surgeons, Journal of Orthopaedic Trauma, Journal of Arthroplasty*)

Practice-Based Learning and Improvement 2: Reflective Practice and Commitment to Personal Growth **Overall Intent:** To seek clinical performance information with the intent to improve care; reflects on all domains of practice, personal interactions, and behaviors, and their impact on colleagues and patients (reflective mindfulness); develop clear objectives and goals for improvement in some form of a learning plan	
Milestones	**Examples**
Level 1 *Accepts responsibility for personal and professional development by establishing goals* *Identifies the strengths, deficiencies and limitations in one's knowledge and expertise*	● Sets a study plan for the Orthopaedic In-Training Exam (OITE) ● Reflects on feedback from patient care team members ● Identifies gaps in knowledge
Level 2 *Demonstrates openness to feedback and other input in order to inform goals* *Analyzes and reflects on the strengths, deficiencies and limitations in one's knowledge and expertise to design a learning plan, with assistance*	● Integrates and responds to feedback to adjust clinical performance ● Assesses time management skills and how it impacts timely completion of clinic notes and literature reviews ● Develops individual education plan to improve study skills and knowledge base, with assistance
Level 3 *Responds to feedback and other input episodically, with adaptability, and humility* *Creates and implements a learning plan to optimize educational and professional development*	● Uses feedback to modify personal professional development goals ● Creates a comprehensive personal curriculum to improve education, including monitoring and accountability for a study plan
Level 4 *Actively seeks feedback and other input with adaptability, and humility* *Uses ongoing reflection, feedback, and other input to measure the effectiveness of the learning plan and when necessary, improves it*	● Asks for feedback from peers, faculty members, and ancillary team members ● Debriefs with the attending and other patient care team members after patient encounter to optimize future collaboration in the care of the patient and family ● Uses the results from the OITE to modify the study plan to address deficiencies
Level 5 *Role models consistently seeking feedback and other input with adaptability and humility* *Coaches others on reflective practice*	● Models and teaches practice improvement through focused study and reflective feedback ● Develops educational module for collaboration with other patient care team members
Assessment Models or Tools	● ABOS Behavioral Skills Tools ● Core conference participation ● Direct observation

	● Review of learning plan
Curriculum Mapping	●
Notes or Resources	● Burke AE, Benson B, Englander R, Carraccio C, Hicks PJ. Domain of competence: practice-based learning and improvement. *Academic Pediatrics*. 2014;14(2 Suppl):S38-S54. https://www.academicpedsjnl.net/article/S1876-2859(13)00333-1/pdf. 2021. ● Hojat M, Veloski JJ, Gonnella JS. Measurement and correlates of physicians' lifelong learning. *Academic Medicine*. 2009;84(8):1066-1074. https://journals.lww.com/academicmedicine/fulltext/2009/08000/Measurement_and_Correlates_of_Physicians__Lifelong.21.aspx. 2021. ● Lockspeiser TM, Schmitter PA, Lane JL, Hanson JL, Rosenberg AA, Park YS. Assessing residents' written learning goals and goal writing skill: validity evidence for the learning goal scoring rubric. *Academic Medicine*. 2013;88(10):1558-1563. https://journals.lww.com/academicmedicine/fulltext/2013/10000/Assessing_Residents__Written_Learning_Goals_and.39.aspx. 2021.

Professionalism 1: Professional Behavior and Ethical Principles **Overall Intent:** To recognize and address lapses in ethical and professional behavior, demonstrates ethical and professional behaviors, and use appropriate resources for managing ethical and professional dilemmas	
Milestones	**Examples**
Level 1 *Identifies and describes inciting events for professionalism lapses* *Demonstrates knowledge of the ethical principles underlying patient care (e.g., informed consent, surrogate decision making, advance directives, confidentiality, error disclosure, stewardship of limited resources, and related topics)*	● Identifies fatigue, illness, increased substance/alcohol use and unmanaged stress as contributing factors to professional lapses ● Relates the importance of patient autonomy as it relates to informed consent including the role of surrogates and advance directives ● Understands the impact of disclosing errors in patient care and loss of patient confidentiality
Level 2 *Demonstrates insight into professional behavior in straightforward situations* *Applies ethical principles in straightforward situations and takes responsibility for lapses*	● Understands perceptions created by tone of voice, timing/place of feedback within the health care team during daily patient care activities ● Notifies appropriate people of personal mistakes; does not make excuses ● Accepts responsibility when supervising residents who do not provide appropriate instruction to learners (e.g., wrong labs, splint)
Level 3 *Demonstrates professional behavior in complex situations* *Integrates ethical principles and recognizes the need to seek help in complex situations*	● Does not attribute blame when discussing adverse outcome with family members or the patient ● Uses respectful, unemotional communication in discussions when resolving conflict within health care team ● Notifies site director or appropriate supervisor after noticing a colleague seems to be impaired
Level 4 *Recognizes situations that may promote professionalism lapses and intervenes to prevent lapses in self and others* *Recognizes and uses appropriate resources for managing and resolving ethical dilemmas (e.g., ethics consultations, literature review, risk management/legal consultation)*	● Acts in patient's best interest when collaborating with other health care services to determine appropriate admission service ● Elevates issues regarding end-of-life decisions to appropriate channels when family or other conflict is evident (e.g., Ethics Committee, legal counsel, risk management)
Level 5 *Coaches others when their behavior fails to meet professional expectations*	● Chooses appropriate setting and tone in discussions with others regarding suboptimal professional behavior

Identifies and seeks to address system-level factors that induce or exacerbate ethical problems or impede their resolution	● Recognizes source of repetitive conflict between members of health care team and recommends institutional policy to resolve ● Devises materials to aid others in learning to provide informed consent
Assessment Models or Tools	● Direct observation ● Global evaluation ● Multisource feedback ● Oral or written self-reflection ● Simulation
Curriculum Mapping	●
Notes or Resources	● American Medical Association (AMA). Ethics. https://www.ama-assn.org/delivering-care/ama-code-medical-ethics. 2021. ● ABIM Foundation, ACP-ASIM Foundation, European Federation of Internal Medicine. Medical professionalism in the new millennium: A physician charter. *Perspectives*. 2002. https://abimfoundation.org/wp-content/uploads/2015/12/Medical-Professionalism-in-the-New-Millenium-A-Physician-Charter.pdf. 2021. ● Bynny RL, Paauw DS, Papadakis MA, Pfeil S. *Medical Professionalism Best Practices: Professionalism in the Modern Era*. Aurora, CO: Alpha Omega Alpha Medical Society; 2017. http://alphaomegaalpha.org/pdfs/Monograph2018.pdf. 2021. ● Domen RE, Johnson K, Conran RM, et al. Professionalism in pathology: A case-based approach as a potential education tool. *Arch Pathol Lab Med.* 2017;141(2):215-219. https://meridian.allenpress.com/aplm/article/141/2/215/132523/Professionalism-in-Pathology-A-Case-Based-Approach. 2021. ● Levinson W, Ginsburg S, Hafferty FW, Lucey CR. *Understanding Medical Professionalism*. 1st ed. New York, NY: McGraw-Hill Education; 2014. https://accessmedicine.mhmedical.com/book.aspx?bookID=1058. 2021.

Professionalism 2: Accountability/Conscientiousness **Overall Intent:** To take responsibility for one's own actions and the impact on patients and other members of the health care team	
Milestones	**Examples**
Level 1 *Reliably arrives to clinical activities on time and describes strategies for ensuring timely task completion* *Responds promptly to requests or reminders to complete tasks and responsibilities*	● Completes work hour logs promptly ● Exhibits punctuality in conference attendance ● Completes end-of-rotation evaluations
Level 2 *Performs tasks and responsibilities in a timely manner with appropriate attention to detail in straightforward situations* *Completes tasks and responsibilities without reminders*	● Completes administrative tasks, documents safety modules, procedure review, and licensing requirements by specified due date ● Completes tasks before going out of town in anticipation of lack of computer access while traveling
Level 3 *Prioritizes tasks and responsibilities in a timely manner with appropriate attention to detail in complex situations* *Proactively completes tasks and responsibilities to ensure that the needs of patients, teams, and systems are met*	● Notifies attending of multiple competing demands on call, appropriately triages tasks, and asks for assistance from other residents or faculty members as needed ● Arranges coverage for assigned clinical tasks in preparation for being out of the office to ensure appropriate continuity of care
Level 4 *Recognizes barriers that may impact others' ability to complete tasks and responsibilities in a timely manner*	● Takes responsibility for inadvertently omitting key patient information during sign-out ● Recognizes personal deficiencies in communication with team members about patient care needs ● Recognizes when multiple residents are unavailable, the outpatient clinic will be negatively affected and appointments delayed
Level 5 *Develops processes to enhance other's ability to efficiently complete patient care tasks and responsibilities*	● Leads interdisciplinary team to identify problems and specific solutions to develop a process to streamline patient discharges
Assessment Models or Tools	● ABOS Behavioral Skills Tool ● Compliance with deadlines and timelines ● Direct observation ● Global evaluations ● Multisource feedback ● Self-evaluations and reflective tools

	● Simulation
Curriculum Mapping	●
Notes or Resources	● AMA. Ethics. https://www.ama-assn.org/delivering-care/ama-code-medical-ethics. 2021. ● American Academy of Orthopaedic Surgeons (AAOS). Code of Ethics and Professionalism for Orthopaedic Surgeons. https://www.aaos.org/about/bylaws-policies/ethics-and-professionalism/code/. 2021. ● Code of conduct from fellow/resident institutional manual ● Expectations of residency program regarding accountability and professionalism

Professionalism 3: Well-Being **Overall Intent:** To identify, use, manage, improve, and seek help for personal and professional well-being for self and others	
Milestones	**Examples**
Level 1 *Recognizes the importance of addressing personal and professional well-being (e.g., physical and emotional health)*	● Acknowledges own response to patient's poor outcome ● Receives feedback on missed emotional cues after a family meeting
Level 2 *Lists available resources for personal and professional well-being* *Describes institutional resources that are meant to promote well-being*	● Independently identifies and communicates impact of a personal family tragedy ● Lists GME counseling services, suicide hotline, and well-being committee representatives available at the institution
Level 3 *Discusses a plan to promote personal and professional well-being with institutional support* *Recognizes which institutional factors affect well-being*	● Develops a reflective response to deal with personal impact of difficult patient encounters and disclosures with the interdisciplinary team ● Identifies faculty mentors
Level 4 *Independently develops a plan to promote personal and professional well-being* *Describes institutional factors that positively and/or negatively affect well-being*	● Identifies ways to manage personal stress and responses to unexpected patient outcomes, independently ● Identifies initiatives within the residency program to improve well-being
Level 5 *Creates institutional level interventions that promote colleagues' well-being* *Describes institutional programs designed to examine systemic contributors to burnout*	● Assists in organizational efforts to address clinician well-being after patient diagnosis/prognosis/death ● Implements a lasting initiative to improve resident well-being within the program
Assessment Models or Tools	● ABOS Behavioral Assessment Tool ● Direct observation ● Group interview or discussions for team activities ● Individual interview ● Institutional online training modules ● Self-assessment and personal learning plan
Curriculum Mapping	●
Notes or Resources	● This subcompetency is not intended to evaluate a resident's well-being, but to ensure each resident has the fundamental knowledge of factors that impact well-being, the

	mechanisms by which those factors impact well-being, and available resources and tools to improve well-being. ● ACGME. “Well-Being Tools and Resources.” https://dl.acgme.org/pages/well-being-tools-resources. 2021. ● Ames SE, Cowan JB, Kenter K, Emery S, Halsey D. Burnout in orthopaedic surgeons: A challenge for leaders, learners, and colleagues: AOA critical issues. *J Bone Joint Surg Am.* 2017;99(14):e78. https://journals.lww.com/jbjsjournal/Abstract/2017/07190/Burnout_in_Orthopaedic_Surgeons__A_Challenge_for.12.aspx. 2021. ● Daniels AH, DePasse JM, Kamal RN. Orthopaedic surgeon rurnout: Diagnosis, treatment, and prevention. *J Am Acad Orthop Surg*. 2016;24(4):213-9. https://www.researchgate.net/publication/294918464_Orthopaedic_Surgeon_Burnout_Diagnosis_Treatment_and_Prevention. 2021. ● Hicks PJ, Schumacher D, Guralnick S, Carraccio C, Burke AE. Domain of competence: Personal and professional development. *Acad Pediatr*. 2014 Mar-Apr;14(2 Suppl):S80-97. https://pubmed.ncbi.nlm.nih.gov/24602666/. 2021. ● Local resources, including Employee Assistance

Interpersonal and Communication Skills 1: Patient- and Family-Centered Communication **Overall Intent:** To deliberately use language and behaviors to form constructive relationships with patients and family; identify communication barriers including recognizing biases and health care needs while respecting patient autonomy in communications; organize and lead communication around shared decision making	
Milestones	**Examples**
Level 1 *Demonstrates respect and establishes rapport with patient and family (e.g., situational awareness of language, disability, health literacy level, cultural)*	● Introduces self and faculty member, identifies patient and others in the room, and engages all parties in health care discussion with sensitivities to patient and family dynamics
Communicates with patients and their families in an understandable and respectful manner	● Identifies need for trained interpreter with non-English-speaking patients ● Uses age-appropriate and health literacy-appropriate language
Demonstrates basic understanding of informed consent process	● Outlines basic risks, benefits, and alternatives to surgery
Level 2 *Establishes a therapeutic relationship in straightforward encounters*	● Avoids medical jargon and restates patient perspective when discussing a diagnosis and treatment options of a simple fracture
Identifies barriers to effective communication (e.g., health literacy, cultural)	● Uses patient-centered communication when answering questions during the informed consent process ● Recognizes the need for handouts with diagrams and pictures to communicate information to a patient who is unable to read
Answers questions about straightforward treatment plans, with assistance	● Discusses risks, benefits, and alternatives to fixation of simple fracture and consults more senior residents or an attending if questions arise that are beyond the resident's knowledge base ● Uses of receptive body language, eye contact, and posture
Level 3 *Establishes a therapeutic relationship in challenging encounters (e.g., shared decision making)*	● Acknowledges a patient's request for an inappropriate diagnostic study and respectfully redirects and initiates a treatment plan using only appropriate studies
When prompted, reflects on biases while attempting to minimize communication barriers	● Modifies a treatment plan to achieve patient's goal after a middle-aged patient states a desire to run a marathon despite knee pain, even though the physician has biases about high-impact activity in early arthritis
Counsels patient through decision-making process for straightforward conditions	● Discusses indications, risks, benefits, and alternatives during informed consent for a hip fracture including a discussion of patient functional outcomes

Level 4 *Facilitates difficult discussions to patients and families, (e.g., explaining complications, therapeutic uncertainty)*	● Counsels representative family members in the care of a patient with dementia and a hip fracture when some family members desire surgery and others do not
Recognizes biases and integrates patient's viewpoint and autonomy to ensure effective communication	● Discusses a middle-aged patient's goal to run a marathon after knee replacement surgery despite bias about high-impact activity on a knee replacement; includes identification of risks, benefits, and long-term effects of high-impact running, and a treatment plan to achieve the patient's goal
Counsels patient through decision-making process for complex conditions	● Discusses indications, risks, benefits, and alternatives during informed consent for hip fracture with multiple medical conditions, dementia, and high risk of death associated with surgical or non-surgical treatment, including ambiguous outcomes ● Obtains a consent in emergent situations in a polytrauma patient and documents appropriately
Level 5 *Coaches others in the facilitation of difficult conversations*	● Leads an OSCE for obtaining informed consent in hip fracture patients with dementia
Mentors others in situational awareness and critical self-reflection	● Observes interactions between more junior residents and patients and offers constructive feedback ● Serves on a hospital bioethics committee
Counsels patient through decision-making process for uncommon conditions	● Develops supplemental materials to better inform patients prior to total joint arthroplasty ● Counsels patient's family about treatment options for a congenital hand deformity
Assessment Models or Tools	● ABOS Behavioral Assessment Tool ● Direct observation ● OSCE ● Simulation ● Standardized patients ● Self-assessment including self-reflection exercises
Curriculum Mapping	●
Notes or Resources	● Laidlaw A, Hart J. Communication skills: an essential component of medical curricula. Part I: Assessment of clinical communication: AMEE Guide No. 51. *Med Teach*. 2011;33(1):6-8. https://www.tandfonline.com/doi/full/10.3109/0142159X.2011.531170. 2021. ● Makoul G. Essential elements of communication in medical encounters: The Kalamazoo consensus statement. *Acad Med*. 2001;76:390-393. https://pubmed.ncbi.nlm.nih.gov/11299158/. 2021.

	● Project Implicit. https://implicit.harvard.edu/implicit/takeatest.html. 2021. ● Symons AB, Swanson A, McGuigan D, Orrange S, Akl EA. A tool for self-assessment of communication skills and professionalism in residents. *BMC Med Educ*. 2009;9:1. https://bmcmededuc.biomedcentral.com/articles/10.1186/1472-6920-9-1. 2021.

Interpersonal and Communication Skills 2: Interprofessional and Team Communication **Overall Intent:** To effectively communicate with the health care team, including other care providers, staff members, and ancillary personnel, in both straightforward and complex situations	
Milestones	**Examples**
Level 1 *Recognizes the value and role of each team member and respectfully interacts with all members of health care team*	● Answers questions respectfully and patiently for radiology tech regarding x-ray orders understanding that the radiology tech plays in important role in care of the orthopaedic patient ● Receives an emergency department consult for a simple fracture and respectfully takes the patient information
Level 2 *Communicates in a professional and productive manner to facilitate teamwork (e.g., active listening, updates in timely fashion)*	● Communicates with the radiology tech the need for specialized x-ray views in an unstable fracture and assists with limb positioning if requested by the tech ● Communicates with the emergency department physician a diagnosis of evolving compartment syndrome and need for timely optimization and mobilization of the patient to the operating room
Level 3 *Actively recognizes and mitigates communication barriers and biases with the health care team*	● Communicates respectfully with trauma team the prioritization of stabilization in a polytrauma patient with an unstable pelvis fracture, femur fracture, and multiple visceral injuries ● Recognizes the need for respectful communication between services when a conflict arises regarding which service will admit the patient
Level 4 *Facilitates respectful communications and conflict resolution with the multidisciplinary health care team*	● Initiates a multidisciplinary conversation to alleviate conflict around a shared care plan for a patient with unstable pelvis fracture, femur fracture, and multiple visceral injuries ● Attends medical rounds to review consult findings about the possible septic knee and provides education of the medical team about evaluation of a septic joint
Level 5 *Exemplar of effective and respectful communication strategies*	● Mediates a conflict resolution between different members of the health care team
Assessment Models or Tools	● ABOS Behavioral Assessment Tool ● Direct observation ● Global assessment ● Multi-source feedback ● OSCE ● Simulation ● Standardized patient
Curriculum Mapping	●
Notes or Resources	● Braddock CH, Edwards KA, Hasenberg NM, Laidley TL, Levinson W. Informed decision making in outpatient practice: Time to get back to basics. *JAMA.* 1999;282(24):2313-2320. https://pubmed.ncbi.nlm.nih.gov/10612318/. 2021.

	● Dehon E, Simpson K, Fowler D, Jones A. Development of the faculty 360. *MedEdPORTAL*. 2015;11:10174 http://doi.org/10.15766/mep_2374-8265.10174. 2021. ● Fay D, Mazzone M, Douglas L, Ambuel B. A validated, behavior-based evaluation instrument for family medicine residents. *MedEdPORTAL.* https://www.mededportal.org/doi/10.15766/mep_2374-8265.622. 2021. ● François, J. Tool to assess the quality of consultation and referral request letters in family medicine. *Can Fam Physician*. 2011 May;57(5), 574–575. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3093595/. 2021. ● Green M, Parrott T, Cook G., Improving your communication skills. BMJ 2012;344. https://www.bmj.com/content/344/bmj.e357. 2021. ● Henry SG, Holmboe ES, Frankel RM. Evidence-based competencies for improving communication skills in graduate medical education: A review with suggestions for implementation. *Med Teach*. 2013 May; 35(5):395-403. https://pubmed.ncbi.nlm.nih.gov/23444891/. 2021. ● Lane JL, Gottlieb RP. Structured clinical observations: A method to teach clinical skills with limited time and financial resources. *Pediatrics*. 2000;105(4 Pt 2):973-977. https://pubmed.ncbi.nlm.nih.gov/10742358/. 2021. ● Roth CG, Eldin KW, Padmanabhan V, Freidman EM. Twelve tips for the introduction of emotional intelligence in medical education. *Med Teach*. 2019;41(7):746-749. https://pubmed.ncbi.nlm.nih.gov/30032720/. 2021.

Interpersonal and Communication Skills 3: Communication within Health Care Systems **Overall Intent:** To effectively communicate across the health care system using the medical record	
Milestones	**Examples**
Level 1 *Accurately records information in the patient record while safeguarding patient personal health information*	● Documents relevant information accurately ● Shreds patient list after rounds; avoids talking about patients in the elevator ● Maintains HIPAA compliance with all communications
Level 2 *Demonstrates accurate, timely, and efficient use of electronic health record to communicate with the health care team* *Uses appropriate communication methods (e.g., face-to-face, voice, electronic)*	● Documents clinical reasoning in an organized manner that supports the treatment plan ● Develops documentation templates to avoid copy-and-paste errors ● Calls attending if care plan is urgent ● Uses institution authorized methods when texting
Level 3 *Concisely reports diagnostic and therapeutic reasoning while incorporating relevant outside data* *Respectfully initiates communications about concerns in the system*	● Documents a clear rationale for surgical treatment of periprosthetic hip fracture including risks, benefits, and alternatives ● Obtains outside records including prior implant records ● Tells more senior resident or attending about an order set in the EHR with a medication dosing that could result in an error ● Identifies and reports safety near-misses using the hospital reporting system
Level 4 *Independently communicates via written or verbal methods based on urgency and context* *Uses appropriate channels to offer clear and constructive suggestions to improve the system*	● Calls attending with assessment and recommends a plan for surgical treatment of a periprosthetic hip fracture including implant choices ● Triages and communicates time urgency of treatment of a polytruama patient ● Works with information technology/sends a help desk ticket to improve an order set or dot phrase
Level 5 *Facilitates improved written and verbal communication of others* *Guides departmental or institutional communication around policies and procedures*	● Holds one-on-one teaching sessions with residents and medical students to improve documentation ● Gives grand rounds or resident lectures that includes care models/pathway utilization
Assessment Models or Tools	● ABOS Behavioral Assessment Tool ● Direct observation ● Medical record (chart) review ● Multisource feedback ● Rotation evaluation
Curriculum Mapping	●

Notes or Resources	● Bierman JA, Hufmeyer KK, Liss DT, Weaver AC, Heiman HL. Promoting responsible electronic documentation: Validity evidence for a checklist to assess progress notes in the electronic health record. *Teach Learn Med.* 2017;29(4):420-432. https://www.tandfonline.com/doi/full/10.1080/10401334.2017.1303385. 2021. ● Haig KM, Sutton S, Whittington J. SBAR: A shared mental model for improving communication between clinicians. *Jt Comm J Qual Patient Saf*. 2006;32(3)167-175. https://www.ncbi.nlm.nih.gov/pubmed/16617948. 2021. ● Starmer AJ, Spector ND, Srivastava R, et al. I-PASS, a mnemonic to standardize verbal handoffs. *Pediatrics*. 2012;129(2):201-204. https://ipassinstitute.com/wp-content/uploads/2016/06/I-PASS-mnemonic.pdf. 2021.

To help programs transition to the new version of the Milestones, the ACGME has mapped the original Milestones 1.0 to the new Milestones 2.0. Indicated below are where the subcompetencies are similar between versions. These are not exact matches, but are areas that include similar elements. Not all subcompetencies map between versions. Inclusion or exclusion of any subcompetency does not change the educational value or impact on curriculum or assessment.

Milestones 1.0	Milestones 2.0
PC1: Anterior Cruciate Ligament	PC4: Operative Management of Arthroscopically Treated Conditions PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC2: Ankle Arthritis	PC4: Operative Management of Arthroscopically Treated Conditions PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC3: Ankle Fracture	PC1: Operative Management of Fractures and Dislocation PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC4: Carpal Tunnel	PC2: Operative Management of Soft Tissue Pathology PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC5: Degenerative Spinal Conditions	PC3: Operative Management of Degenerative, Infectious, and Neoplastic Conditions PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC6: Diabetic Foot	PC1: Operative Management of Fractures and Dislocation PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC7: Diaphyseal Femur and Tibia Fracture	PC5: Operative Management of Pediatric Conditions PC7: Evaluation and Management of the Pediatric Orthopaedic Patient
PC8: Distal Radius Fracture	PC1: Operative Management of Fractures and Dislocation PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC9: Adult Elbow Fracture	PC1: Operative Management of Fractures and Dislocation PC6: Evaluation and Management of the Adult Orthopaedic Patient

PC10: Hip and Knee Osteo Arthritis	PC4: Operative Management of Arthroscopically Treated Conditions PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC11: Hip Fracture	PC1: Operative Management of Fractures and Dislocation PC3: Operative Management of Degenerative, Infectious, and Neoplastic Conditions PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC12: Metastatic Bone Lesion	PC3: Operative Management of Degenerative, Infectious, and Neoplastic Conditions PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC13: Meniscal Tear	PC4: Operative Management of Arthroscopically Treated Conditions PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC14: Pediatric Septic Hip	PC5: Operative Management of Pediatric Conditions PC7: Evaluation and Management of the Pediatric Orthopaedic Patient
PC15: Rotator Cuff Injury	PC2: Operative Management of Soft Tissue Pathology PC6: Evaluation and Management of the Adult Orthopaedic Patient
PC16: Pediatric Supracondylar Humerus Fracture	PC5: Operative Management of Pediatric Conditions PC7: Evaluation and Management of the Pediatric Orthopaedic Patient
MK1: Anterior Cruciate Ligament	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK2: Ankle Arthritis	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK3: Ankle Fracture	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK4: Carpal Tunnel	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK5: Degenerative Spinal Conditions	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK6: Diabetic Foot	MK1: Orthopaedic Clinical Decision Making

	MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK7: Diaphyseal Femur and Tibia Fracture	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK8: Distal Radius Fracture	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK9: Adult Elbow Fracture	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK10: Hip and Knee Osteo Arthritis	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK11: Hip Fracture	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK12: Metastatic Bone Lesion	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK13: Meniscal Tear	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK14: Pediatric Septic Hip	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK15: Rotator Cuff Injury	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
MK16: Pediatric Supracondylar Humerus Fracture	MK1: Orthopaedic Clinical Decision Making MK2: Anatomy and Physiology of Musculoskeletal Conditions
SBP1: Systems thinking, including cost-effective practice	SBP3: Physician Role in Health Care Systems
SBP2: Resident will work in interprofessional teams to enhance patient safety and quality care	SBP1: Patient Safety and Quality Improvement SBP2: System Navigation for Patient-Centered Care
SBP3: Uses technology to accomplish safe health care delivery	ICS3: Communication within Health Care Systems
PBLI1: Self-Directed Learning	PBLI2: Reflective Practice ad Commitment to Personal Growth
PBLI2: Locate, appraise, and assimilate evidence from scientific studies to improve patient care	PBLI1: Evidence-Based and Informed Practice
PROF1: Compassion, integrity, and respect for others as well as sensitivity and responsiveness to heterogenous patient populations, including but not limited to variety of age, culture, race, religion, disabilities, and sex. Knowledge about respect for and adherence to the ethical principles relevant to the practice of medicine, remembering in particular that	PROF1: Professional Behavior and Ethical Principles

responsiveness to patients that supersedes self-interest is an essential aspect of medical practice	
PROF2: Accountability to patients, society, and the profession; personal responsibility to maintain emotional, physical, and mental health	PROF2: Accountability/Conscientiousness PROF3: Well-Being
ICS1: Communication	ICS1: Patient- and Family-Centered Communication ICS2: Interprofessional and Team Communication
ICS2: Teamwork	ICS2: Interprofessional and Team Communication

Available Milestones Resources

Milestones 2.0: Assessment, Implementation, and Clinical Competency Committees Supplement, 2021 - *https://meridian.allenpress.com/jgme/issue/13/2s*

Milestones Guidebooks: https://www.acgme.org/milestones/resources/

- *Assessment Guidebook*
- *Clinical Competency Committee Guidebook*
- *Clinical Competency Committee Guidebook Executive Summaries*
- *Implementation Guidebook*
- *Milestones Guidebook*

Milestones Guidebook for Residents and Fellows: https://www.acgme.org/residents-and-fellows/the-acgme-for-residents-and-fellows/

- Milestones Guidebook for Residents and Fellows
- Milestones Guidebook for Residents and Fellows Presentation
- Milestones 2.0 Guide Sheet for Residents and Fellows

Milestones Research and Reports: https://www.acgme.org/milestones/research/

- *Milestones National Report*, updated each fall
- *Milestones Predictive Probability Report,* updated each fall
- *Milestones Bibliography*, updated twice each year

Developing Faculty Competencies in Assessment courses - https://www.acgme.org/meetings-and-educational-activities/courses-and-workshops/developing-faculty-competencies-in-assessment/

Assessment Tool: Direct Observation of Clinical Care (DOCC) - https://dl.acgme.org/pages/assessment

Assessment Tool: Teamwork Effectiveness Assessment Module (TEAM) - https://team.acgme.org/

Improving Assessment Using Direct Observation Toolkit - https://dl.acgme.org/pages/acgme-faculty-development-toolkit-improving-assessment-using-direct-observation

Remediation Toolkit - https://dl.acgme.org/courses/acgme-remediation-toolkit

Learn at ACGME has several courses on Assessment and Milestones - https://dl.acgme.org/