Supplemental Guide:
Hand Surgery

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Milestones Supplemental Guide

This document provides additional guidance and examples for the Hand 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: Traumatic Bone and Joint Injury **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 treatment plan for simple fractures and dislocations, with assistance*	● Appropriately orders basic imaging studies for wrist and hand fractures ● Describes basic understanding of relevant reduction method and appropriate fixation technique (percutaneous/open, external fixation, screw, plate, nail)
Performs simple fracture and dislocation procedures, with assistance	● Demonstrates proper technique in closed reduction and splint application, with assistance ● Demonstrates proper patient positioning and accurately marks incision ● Displays atraumatic soft tissue handling with superficial dissection and closure ● Demonstrates proper technique in drilling and screw placement ● Explains radiation exposure mitigation factors ● Exhibits proper technique in sterile dressing and relevant splint application ● Demonstrates competence in neurological assessment
Identifies patients with abnormal post-operative course	● Explains examples of typical post-operative neurological and vascular deficits, including compartment syndrome and method for reporting ● Identifies pin tract infection/wound dehiscence and reports appropriately ● Identifies potential narcotic misuse/dependence and describes appropriate method for reporting
Level 2 *Develops a treatment plan for simple fractures and dislocations*	● Appropriately interprets basic imaging studies ● Explains rationale for method of fracture fixation, incorporating concepts of absolute and relative stability ● Describes appropriate surgical approach (volar/dorsal/mid-axial) ● Describes equipment needs for procedure and institutional protocol to ensure availability ● Describes short-term rehabilitation plan
Performs simple fracture and dislocation procedures	● Performs closed reduction of core fractures (phalangeal, metacarpal, distal radius) ● Performs provisional operative reduction of core fractures with assistance ● Exhibits competence in percutaneous pin placement with direction ● Demonstrates appropriate analysis of fluoroscopic imaging ● Demonstrates ability to progress through deeper layers of exposure with minimal trauma to extensor mechanism ● Identifies proper starting point for cannulated screw fixation for a scaphoid fracture ● Demonstrates proper plate selection and application for extra-articular fractures

Manages simple complications	● Identifies and independently initiates treatment of neurovascular deficits with attention to splint, limb position, compartment pressure measurements ● 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
Level 3 *Develops a treatment plan for moderately complex fractures and dislocations*	● Appropriately interprets advanced imaging studies (computerized tomography (CT), magnetic resonance imaging (MRI)) ● Develops a comprehensive surgical plan for a simple articular fracture to include surgical approach, imaging (type and orientation), detailed method of reduction and fixation, instrumentation, and contingency plans ● Includes a comprehensive plan for post-operative care including digital motion, hand use, and indications for formal hand therapy ● Confirms availability of necessary equipment
Performs moderately complex fracture and dislocation procedures	● Demonstrates proper closed or percutaneous reduction of simple intra-articular fracture ● Performs lag screw fixation and neutralization plate application independently ● Demonstrates proper pin placement, drilling, and screw insertion for non-displaced scaphoid waist fracture ● Explains proper soft tissue management and debridement of open fractures ● Independently applies uniplanar external fixator ● Describes proper fabrication of dynamic phalangeal external fixator ● Performs hand and forearm fasciotomy with assistance
Identifies and formulates a plan for complications requiring surgical management	● Identifies associated patient and soft tissue factors that may delay or modify surgical approach ● Accurately identifies associated soft tissue injuries (nerve, tendon) and proposes management ● Identifies intra-operative complications (loss of reduction, screw penetration) and describes basic treatment plan ● Initiates treatment plan for early post-operative infection without assistance
Level 4 *Develops treatment plan for complex fractures and dislocations*	● Incorporates the concept of prioritization in the mangled hand, including staged reconstruction ● Develops comprehensive contingency plans for intra-operative complications, including potential neurovascular injury and fixation failure ● Describes algorithm for management of irreducible dislocations ● Describes sources of autogenous bone graft in cases of bone loss

Performs complex fracture and dislocation procedures	● Demonstrates proper soft tissue management and debridement of open fractures ● Describes appropriate wound management of fractures associated with soft tissue loss ● Demonstrates competence in all technical aspects of plate fixation for three-part articular distal radius fracture ● Performs appropriate surgical approach (dorsal/volar) and internal fixation of displaced scaphoid fractures ● Performs appropriate surgical approach and internal fixation of intra-articular phalangeal fractures ● Performs advanced reduction techniques (dynamic external fixation, bridge plating, distraction devices), with assistance ● Identifies and appropriately manages simple intra-operative screw penetration, loss of reduction, neurovascular injury ● Identifies and properly manages associated ligamentous injuries (interosseous) ● Demonstrates appropriate temporizing management of soft tissue defect (negative pressure wound therapy, antibiotic beads, etc.) ● Performs local flap coverage for associated soft tissue defects ● Performs surgical debridement for early post-operative infection, and describes rationale for prosthetic retention/removal
Performs surgical management for routine complications	● 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 ● Performs operative treatment of fractures associated with complex soft tissue injury (neurovascular injury, soft tissue loss requiring coverage, tendon injuries)
Level 5 *Develops a treatment plan for complex revision, malunion, nonunion, and dislocation procedures*	● Develops a surgical plan for osteotomy in management of malunion ● Develops a plan for surgical management of scaphoid nonunion ● Develops a plan for surgical management of early loss of fixation ● Describes the indications for and technique of hemi-hamate arthroplasty ● Describes the indications for the Masquelet technique
Performs complex revision, malunion, nonunion, and dislocation procedures	● Independently performs surgical approach, reduction, and fixation of fractures associated with bone loss

Performs surgical management for complex complications	● Independently performs advanced reduction techniques (dynamic external fixation, bridge plating, distraction devices) ● Performs appropriate osteotomy for distal radius and phalangeal malunion ● Performs hemi-hamate arthroplasty for unreconstructable proximal interphalangeal (PIP)fracture-dislocations ● Capable of managing combined injuries (e.g., associated tendon, ligament, bone loss) ● Performs arthroscopic assisted reduction of wrist fractures/intra articular fracture ● Implements a plan for revision internal fixation following fixation failure ● Performs arthrodesis for unsalvageable fractures/dislocations
Assessment Models or Tools	● Direct observation ● 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. ● 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. ● Operating room standards list/safe fluoroscopy list

Patient Care 2: Soft Tissue Trauma **Overall Intent:** To perform core and advanced procedures for management of soft tissue trauma, including developing an operative plan and managing complications	
Milestones	**Examples**
Level 1 *Develops a treatment plan for simple soft tissue procedures, with assistance* *Performs simple soft tissue procedures, with assistance* *Identifies patients with abnormal recovery*	● Identifies extent and depth of laceration, burn, or other injury ● Identifies the type of tendon injury and level ● Develops plan and performs treatment with assistance in the appropriate setting (emergency room versus operating room, acute versus delayed) including debridement, primary closure, healing by secondary intention ● Performs extensor tendon repair, with assistance ● Identifies complications such as delayed healing and wound infection ● Identifies tendon rupture
Level 2 *Develops a treatment plan for simple soft tissue procedures* *Performs simple soft tissue procedures* *Manages simple complications*	● Same as Level I, but more independence in performing simple procedures and managing complications ● Performs extensor tendon repair without assistance ● Performs flexor tendon repair outside of zone 2 ● Performs irrigation and debridement of flexor tenosynovitis or fight bite ● Manages wound dehiscence ● Manages tendon adhesions non-operatively
Level 3 *Develops a treatment plan for moderately complex soft tissue procedures* *Performs moderately complex soft tissue procedures* *Identifies and formulates a plan for complications requiring surgical management*	● Identifies extent and depth of injury, diagnoses specific injured structures including skin, tendon, nerve, and vascular injuries, and develops a plans treatment in the appropriate setting ● Performs skin grafts including split and/or full thickness ● Performs flexor tendon repair in zone 2 ● Performs local hand flaps ● Manages deep soft tissue infections such as thenar space, horseshoe abscess ● Formulates a plan for complications such as graft loss or tendon rupture
Level 4 *Develops treatment plan for complex soft tissue procedures*	● Identifies more complex injuries including multiple injured structures, polytrauma, delayed presentation, or situations requiring staged reconstruction such as a mangled hand

Performs complex soft tissue procedures *Performs surgical management for routine complications*	● Performs two-stage flexor tendon reconstruction ● Performs regional flap coverage ● Performs vascular repair ● Manages necrotizing fasciitis ● Manages complications such as flap necrosis
Level 5 *Develops a treatment plan for complex trauma, microsurgery, tendon reconstruction, and revision soft tissue procedures* *Performs complex microsurgical reconstruction and tendon transfers* *Performs surgical management for complex complications*	● Develops a treatment plan for toe transfer, hand transplant, complex reconstruction after burn, replantation, microsurgery, and/or hypothenar hammer syndrome ● Performs microsurgical or free flap reconstruction ● Performs vascular reconstruction with intercalary graft ● Performs tendon transfer ● Manages complications such as ischemia, venous congestion, flap, or digit necrosis
Assessment Models or Tools	● Direct observation ● Multisource feedback ● Hand Society's Surgical Training and Educational Platform (STEP)
Curriculum Mapping	●
Notes or Resources	● American Society for Surgery of the Hand (ASSH). Surgical simulation resources. 2021. https://www.assh.org/s/surgical-simulation. ● ASSH. Hand.e video collection. 2021. https://www.assh.org/hande/s/. ● Buntic R. Atlas of microsurgery techniques and principles. 2021. www.microsurgeon.org. ● Mathes, SJ, Nahai, F. *Reconstructive Surgery: Principles, Anatomy, and Technique*. St. Louis: Quality Medical Publishing (QMP); 1998. ● Weiss, APC. *ASSH Textbook of Hand and Upper Extremity Surgery.* 2nd ed. Chicago: ASSH; 2019. ● Wolfe, S, Pederson, W, Kozin, S, Cohen, M. *Green's Operative Hand Surgery*. 8th ed. Elsevier; 2021.

Patient Care 3: Arthritis **Overall Intent:** To perform core and advanced procedures for arthritis, including developing an operative plan and managing complications	
Milestones	**Examples**
Level 1 *Develops a treatment plan for simple arthritis conditions, with assistance*	● Appropriately orders basic imaging studies for wrist and hand arthritis ● Develops a nonoperative treatment plan including splinting, therapy, injections, medications, with assistance ● Describes the indications for arthroplasty and arthrodesis
Performs simple arthritis procedures, with assistance	● Performs intra-articular injection, with assistance ● Applies appropriate splint, with assistance ● Writes appropriate hand therapy prescription
Identifies patients with abnormal post-operative course	● Identifies complications following intra-articular injection ● Identifies wound dehiscence during wound check and reports appropriately
Level 2 *Develops a treatment plan for simple arthritis conditions*	● Appropriately interprets basic imaging studies ● Orders appropriate advanced imaging studies ● Describes various internal fixation techniques for arthrodesis

Performs simple arthritis procedures	● Performs uncomplicated arthritis procedures, including:
	  ○ Distal interphalangeal (DIP) arthrodesis
	  ○ Thumb (MP) arthrodesis
	  ○ PIP arthrodesis

Manages simple complications	● 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 ● Describes work-up for suspected infection
Level 3 *Develops a treatment plan for moderately complex arthritis conditions*	● Appropriately interprets advanced imaging studies ● Appropriately selects arthrodesis or arthroplasty as the procedure of choice and describes surgical approach

Performs moderately complex arthritis procedures	● Performs moderately complicated arthritis procedures including:
	  ○ Distal ulna resection
	  ○ Partial wrist fusion and partial carpal fusion
	  ○ Small joint and wrist arthroscopic debridement
	  ○ Total wrist fusion

Identifies and formulates a plan for complications requiring surgical management	○ Basal joint arthroplasty ● Describes the indications for implant retention and removal for early post-operative infection
Level 4 *Develops treatment plan for complex arthritis conditions* *Performs complex arthritis procedures* *Performs surgical management for routine complications*	● Describes implant arthroplasty options and relative indications for each ● Performs complex arthritis procedures, including: ○ MP and joint (PIP) joint arthroplasty ○ Total wrist arthroplasty (DRUJ or radiocarpal) ○ Ulnar head replacement ● Performs debridement and implant retention for early post-operative infection
Level 5 *Develops a treatment plan for complex revision, arthritis procedures* *Performs complex revision arthritis procedures* *Performs surgical management for complex complications*	● Describes the surgical options in the management of arthritis associated with severe bone loss or infection ● Performs complex revision arthritis procedures, without assistance, including: ○ Revision of implant arthroplasty ○ Revision of pseudarthrosis after fusion attempt ○ Revision for failed basal joint arthroplasty ● Performs staged revision for infected implant arthroplasty
Assessment Models or Tools	● Direct observation ● Multisource feedback
Curriculum Mapping	●
Notes or Resources	● ASSH. Hand.e video collection. 2021. https://www.assh.org/hande/s/. ● Weiss, APC. *ASSH Textbook of Hand and Upper Extremity Surgery.* 2nd ed. Chicago: ASSH; 2019. ● Wolfe, S, Pederson, W, Kozin, S, Cohen, M. *Green's Operative Hand Surgery*. 8th ed. Elsevier; 2021.

Patient Care 4: Nerve **Overall Intent:** To perform core and advanced procedures to a variety of nerve pathologies, including compression, injury, or tumor	
Milestones	**Examples**
Level 1 *Develops a treatment plan for simple nerve conditions, with assistance*	● Diagnoses, plans, and performs treatment with assistance for common compressive neuropathies or nerve injuries, such as carpal tunnel syndrome, cubital tunnel syndrome, or digital nerve lacerations ● Appropriately prescribes non-surgical and surgical treatments, such as splints, anti-inflammatory medications, injections, or surgery
Performs simple nerve procedures, with assistance	● Performs carpal tunnel release, ulnar nerve decompression, digital nerve repair, with assistance
Identifies patients with abnormal post-operative course	● Identifies wound healing issues or neuroma formation
Level 2 *Develops a treatment plan for simple nerve conditions*	● Same as Level 1, more independence including management of complications
Performs simple nerve procedures	● Performs carpal tunnel release, ulnar nerve decompression, digital nerve repair
Manages simple complications	● Manages wound dehiscence
Level 3 *Develops a treatment plan for moderately complex nerve conditions*	● Diagnoses less common compressive neuropathies, such as radial tunnel or pronator syndrome, as well as more proximal/mixed nerve injuries and nerve tumors ● Uses appropriate diagnostic tools such as electromyography, ultrasound, MRI, and biopsy ● Develops a treatment plan for major peripheral nerve lacerations and neuromas in the upper extremity ● Appropriately prescribes hand therapy for nerve injuries
Performs moderately complex nerve procedures	● Performs major peripheral nerve repairs, nerve grafting, and regenerative peripheral nerve interface procedures ● Performs carpal tunnel revision surgery ● Performs decompression for less common neuropathies, such as radial tunnel or pronator syndrome
Identifies and formulates a plan for complications requiring surgical management	● Identifies and manages issues such as neuroma or neuropraxia
Level 4 *Develops treatment plan for complex nerve conditions*	● Grades complex nerve injuries such as crush or avulsion, including injury to the brachial plexus, and plans treatment at the appropriate time (acute versus delayed)

Performs complex nerve procedures *Performs surgical management for routine complications*	● Develops a treatment plan for brachial plexus, chronic nerve palsies ● Plans and performs primary reconstruction or distal nerve transfers, understands the role of tendon transfers in complex nerve injuries ● Performs neuroma treatment with targeted muscle regeneration ● Performs revision ulnar nerve ● Prescribes hand therapy, occupational therapy, and orthotics for complex nerve injuries
Level 5 *Develops a treatment plan for complex revision nerve procedures* *Performs complex revision nerve procedures* *Performs surgical management for complex complications*	● Manages failed nerve reconstructions with revision with or without graft, or distal nerve transfers ● Plans and performs nerve transfers for prosthetic control in upper extremity amputations (targeted muscle reinnervation) ● Performs complex revision decompression ● Manages chronic nerve pain with therapy, pharmacologic and non-pharmacologic treatment, and surgery
Assessment Models or Tools	● Direct observation ● Multisource feedback
Curriculum Mapping	●
Notes or Resources	● ASSH. Hand.e video collection. 2021. https://www.assh.org/hande/s/. ● Dy CJ, Isaacs J. *ASSH Surgical Anatomy: Nerve Reconstruction.* Chicago: ASSH; 2019. ● Weiss, APC. *ASSH Textbook of Hand and Upper Extremity Surgery.* 2nd ed. Chicago: ASSH; 2019. ● Wolfe, S, Pederson, W, Kozin, S, Cohen, M. *Green's Operative Hand Surgery*. 8th ed. Elsevier; 2021.

Patient Care 5: Elective (Acquired and Congenital) **Overall Intent:** To effectively evaluate and manage patients with common acquired and/or congenital conditions	
Milestones	**Examples**
Level 1 *Develops a treatment plan for simple elective conditions, with assistance* *Performs simple elective procedures, with assistance* *Identifies patients with abnormal post-operative course*	● Has a basic understanding of conservative and surgical management of conditions such as trigger finger, ganglion cyst, and first dorsal compartment tenosynovitis, etc. ● Performs surgeries such as trigger finger, ganglion cyst excision, first dorsal compartment release, with assistance
Level 2 *Develops a treatment plan for simple elective conditions* *Performs simple elective procedures* *Manages simple complications*	● Appropriately indicates and counsels patients on conservative and surgical management for conditions such as trigger finger, ganglion cyst excision, first dorsal compartment tenosynovitis ● Performs surgeries such as trigger finger, ganglion cyst excision, first dorsal compartment release, without assistance ● Manages complications such as wound dehiscence, superficial infection
Level 3 *Develops a treatment plan for moderately complex elective conditions* *Performs moderately complex elective procedures* *Identifies and formulates a plan for complications requiring surgical management*	● Appropriately indicates and counsels patients on conservative and surgical management for mucous cyst excision with soft tissue advancement, giant cell tumor tendon sheath excision, enchondroma care, management of deep space infections, and flexor tenosynovitis ● Performs surgery such as mucous cyst excision with soft tissue advancement, giant cell tumor tendon sheath excision, enchondroma care, management of deep space infections and flexor tenosynovitis, and percutaneous needle aponeurotomy/collagenase injections, with minimal to no assistance ● Correctly identifies complications such as wound and deep space infections that will not resolve with conservative management
Level 4 *Develops treatment plan for complex elective conditions*	● Develops treatment plan for conditions such as stiff finger or the spastic upper extremity

Performs complex elective procedures	● Performs surgery such as fasciectomy for Dupuytren's disease and tenolysis, contracture releases, and arthrodesis, as well as tendon transfers for the stiff finger and spastic upper extremity
Performs surgical management for routine complications	● Safely manages wound issues and deep space infections surgically when necessary
Level 5 *Develops a treatment plan for complex revision elective procedures*	● Appropriately indicates and counsels patients/parents for conservative and surgical management of complex/complicated congenital anomalies, recurrent Dupuytren's disease
Performs complex revision elective procedures	● Performs surgery such as revision fasciectomy for Dupuytren's disease, pollicization, and other complex/complicated congenital cases
Performs surgical management for complex complications	● Safely manages any complications that may arise from elective surgery
Assessment Models or Tools	● Direct observation ● Multisource feedback
Curriculum Mapping	●
Notes or Resources	● ASSH. Hand.e video collection. 2021. https://www.assh.org/hande/s/. ● Weiss, APC. ASSH Textbook of Hand and Upper Extremity Surgery. 2nd ed. Chicago: ASSH; 2019. ● Wolfe, S, Pederson, W, Kozin, S, Cohen, M. Green's Operative Hand Surgery. 8th ed. Elsevier; 2021.

Medical Knowledge 1: Clinical 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 hand/wrist 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 hand/wrist
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 hand/wrist pain relevant to patient history and exam ● Interprets plain radiographs to determine presence of acute and/or chronic conditions ● Relates the potential findings seen on plain radiographs (e.g., fracture, arthritis, malalignment) ● 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 hand/wrist pain but quickly focus differential based on history and exam ● Orders appropriate adjunct plain radiographs or ancillary studies such as ultrasound, electrodiagnostic studies, CT, or MRI ● Describes the appropriate clinical practice guidelines to guide non-operative and surgical decision making for distal radius fracture ● Uses the clinical examination and appropriate additional studies to make a preliminary diagnosis of distal radius fracture 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 type of fracture, energy of injury, and concomitant injuries ● Considers patient factors including age and patient needs in the need for continued conservative versus operative management ● Incorporates clinical practice guidelines into clinical/radiologic findings to develop a comprehensive surgical and rehabilitation plan ● Uses current evidence, shared decision making, and other resources to decide the most appropriate treatment plan for a distal radius fracture

Level 5 *Incorporates clinical reasoning to improve care pathways*	● Demonstrates knowledge of the interlinked effects of age, surgical versus conservative 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 ● Medical record (chart) audit ● Multisource feedback ● 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. Accessed 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/. Accessed 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. Accessed 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. Accessed 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. Accessed 2021.

Medical Knowledge 2: Anatomy and Physiology of Hand Conditions **Overall Intent:** To apply knowledge of pathoanatomy and pathophysiology to patient care	
Milestones	**Examples**
Level 1 *Identifies anatomy and pathophysiology of straightforward conditions*	● Properly identifies nerve, vessel, and tendon injuries associated with a hand laceration ● Describes the various cord patterns in Dupuytren's disease ● Accurately interprets x-rays in osteoarthritis
Level 2 *Demonstrates knowledge of pathoanatomy, disease classification systems, and natural history for straightforward conditions*	● Describes the radiographic features of inflammatory arthritis ● Describes the classification systems for scapholunate advanced collapse and scaphoid nonunion advanced collapse ● Describes the typical clinical and electrodiagnostic findings in various stages of carpal and cubital tunnel syndrome
Level 3 *Applies knowledge of pathoanatomy and pathophysiology to explain the effects of surgical or non-surgical treatment on patient outcomes for straightforward conditions*	● Explains the etiology of swan neck and boutonnière deformities resulting from trauma ● Explains the etiology of swan neck and boutonnière deformities resulting from inflammatory arthritis ● Describes the secondary deformity patterns resulting from metacarpal and phalangeal malunion
Level 4 *Applies knowledge of pathoanatomy and pathophysiology to treatment options and patient outcomes for complex conditions*	● Describes the typical clinical and electrodiagnostic findings in brachial plexus injury ● Applies understanding of spasticity patterns in cerebral palsy and traumatic brain injury to inform treatments
Level 5 *Disseminates knowledge on the varying patterns of disease presentation, natural history, and treatment options*	● Identifies appropriate patient resources and educates patient about condition ● Develops and presents hand-related lectures to residents and physician extenders ● Publishes review article on hand-related subject
Assessment Models or Tools	● Direct observation ● Hand self-assessment examination ● Objective structured clinical examination (OSCE) ● Radiographic and MRI interpretations
Curriculum Mapping	●
Notes or Resources	● Wolfe, S, Pederson, W, Kozin, S, Cohen, M. Green's Operative Hand Surgery. 8th ed. Elsevier; 2021.Smith RJ. Balance and kinetics of the fingers under normal and pathologic conditions. *Clin Orthop Relat Res* 1974;104:92-111.

Medical Knowledge 3: Diagnostics **Overall Intent:** To understand the indications and appropriate interpretation of diagnostic tests in upper extremity pathology	
Milestones	**Examples**
Level 1 *Gathers and reports basic diagnostic test results*	● Demonstrates ability to locate pertinent diagnostic results from the medical chart ● Synthesizes pertinent positives and negatives from the report of the diagnostic tests such as from wrist MRIs, CT scans, and electromyography
Level 2 *Describes indications for standard diagnostic testing*	● Understands appropriate timing and indications for ordering diagnostic testing including radiographs with specific views, CTs, MRIs, electromyography, ultrasounds, and angiography ● Demonstrates understanding of when to order follow-up electromyography when following nerve recovery ● Demonstrates understanding of indication for follow-up CT scan when following scaphoid fracture healing ● Demonstrates understanding of the use of pre-operative CT scans for complex fracture patterns such as distal radius, elbow, and scaphoid fractures
Level 3 *Prioritizes, orders, and interprets straightforward diagnostic tests*	● Independently orders and interprets radiographs for common hand and upper extremity pathology ● Orders and interprets appropriate specialized radiographic views when indicated: hyper pronated view for thumb carpometacarpal joint (CMC) arthritis, Bora view for fourth/fifth CMC joint, clenched fist view for scapholunate ligament injury, etc.
Level 4 *Prioritizes, orders, and interprets complex diagnostic studies*	● Independently orders and interprets CT scans, MRIs, electromyography, ultrasounds, angiography, etc. for both common AND complex upper extremity pathologies: ○ Angiography for upper extremity vascular disorders ○ CT scan for scaphoid or elbow fractures ○ Electromyography/nerve conduction study for brachial plexus pathology ○ MRI for wrist and elbow injuries ○ Ultrasound for nerve compressive pathology ○
Level 5 *Uses complex diagnostic approaches in novel situations*	● Uses electromyography/nerve conduction study to assess for available nerve transfer or tendon transfer options for patients with complex brachial plexus pathology ● Performs independent ultrasound assessment of nerve healing, neuroma formation, compressive pathology ● Orders and interprets magnetic resonance (MR) neurography for complex nerve pathology ● Uses angiography to plan complex revascularization procedures and flap procedures
Assessment Models or Tools	● Assess and interpret diagnostics during educational sessions

	● Direct observation of imaging interpretation and integration into patient care pathways ● Explain and justify diagnostic decisions in case discussion and patient rounds
Curriculum Mapping	●
Notes or Resources	● Schriber JJ, Feinberg JH, Byun DJ, Lee SK, Wolfe SW. Preoperative donor nerve electromyography as a predictor of nerve transfer outcomes. J *Hand Surg Am.* 2014 Jan;39(1):42-9. doi: 10.1016/j.jhsa.2013.09.042. Epub 2013 Nov 20. ● Wolfe, S, Pederson, W, Kozin, S, Cohen, M. Green's Operative Hand Surgery. 8th ed. Elsevier; 2021.

Medical Knowledge 4: Rehabilitation **Overall Intent:** To initiate, monitor, and individualize patient rehabilitation for both common, complex, and revision upper extremity pathologies	
Milestones	**Examples**
Level 1 *Lists the indications for basic rehabilitation*	● Identifies patients who would benefit from rehabilitation including those with recent traumas or surgical interventions ● Indicates patients for non-operative rehabilitation for common upper extremity pathologies including lateral epicondylitis
Level 2 *Describes different forms of rehabilitation for bone, joint, tendon, and nerve*	● Describes rehabilitation protocols for common upper extremity pathologies including distal radius fractures, thumb CMC arthroplasty, nerve repair, lateral epicondylitis (both non-operative and operatively treated)
Level 3 *Prioritizes, orders, and interprets individualized rehabilitation, including multi-modal rehabilitation protocol for common pathologies*	● Initiates, monitors, and adjusts rehabilitation programs for common pathologies including: ○ Most elective surgeries such as thumb CMC arthroplasty, subtotal palmar fasciectomy, small joint arthroplasty ○ Standard fracture care including distal radius and metacarpal fractures ● Adjusts length of immobilization and/or initiates therapeutic interventions including dynamic or static progressive splinting depending on patient condition and state of recovery
Level 4 *Prioritizes, orders, and interprets individualized rehabilitation, including multi-modal rehabilitation protocol for complex pathologies*	● Initiates, monitors, and adjusts rehabilitation programs for complex pathologies including: ○ Standard tendon and nerve transfers ○ Patients with inflammatory arthritis ○ Complex carpal fracture patterns (greater arc injuries) ○ Combined trauma to the extremity with involvement of multiple systems requiring modification of standard rehabilitation pathways ● Integrates adjunctive therapeutic interventions including ultrasound, muscular stimulation, iontophoresis, or phonophoresis when appropriate to generate an individualized program
Level 5 *Prioritizes, orders, and interprets rehabilitation after complex revision surgery*	● Initiates, monitors, and adjusts rehabilitation programs for complex revision pathologies including: ○ Revision scaphoid fracture fixation ○ Revision soft tissue coverage ○ Revision tendon repair or reconstruction (two-stage) ○ Revision total wrist arthroplasty and finger joint arthroplasties ● Generates individualized rehabilitation programs for revision surgeries
Assessment Models or Tools	● Assess and interpret rehabilitation plans during educational sessions ● Direct observation of rehabilitation integration and management during the initial non-operative and post-operative phases of patient care ● Explain and justify rehabilitation plan during case discussion and patient rounds

Curriculum Mapping	●
Notes or Resources	● Cannon NM (ed). *Diagnosis and Treatment Manual for Physicians & Therapists.* 5th ed. ● Indiana Hand to Shoulder Center; 2020. https://www.diagnosisandtreatmentmanual.com/

Systems-Based Practice 1: Patient Safety and Quality Improvement **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*	● Lists patient misidentification or medication errors as common patient safety events
Demonstrates knowledge of how to report patient safety events	● Describes how to report errors in the institution
Demonstrates knowledge of basic quality improvement methodologies and metrics	● Describes fishbone tool
Level 2 *Identifies system factors that lead to patient safety events*	● Understands that a lack of hand sanitizer dispenser at each clinical exam room may lead to increased infection rates
Reports patient safety events through institutional reporting systems (simulated or actual)	● Reports lack of hand sanitizer dispenser at each clinical exam room to the medical director
Describes local quality improvement initiatives (e.g., infection rate, smoking cessation)	● Summarizes protocols resulting in decrease perioperative infections
Level 3 *Participates in analysis of patient safety events (simulated or actual)*	● Prepares for morbidity and mortality presentations
Participates in disclosure of patient safety events to patients and their families (simulated or actual)	● Through simulation, communicates with patients/families about an intra-operative fracture
Participates in local quality improvement initiatives	● Participates in a project identifying the root cause of rooming inefficiency
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 a wrong-side surgery and can effectively communicate with patients/families about those events
Discloses patient safety events to patients and their families (simulated or actual)	● Participates in the completion of a QI project to improve referrals to bone health for patients with distal radius fractures within the practice, including assessing the problem,

Demonstrates the skills required to identify, develop, implement, and analyze a quality improvement project	articulating a broad goal, developing a SMART (Specific, Measurable, Attainable, Relevant, Time-bound) objective plan, and monitoring progress and challenges
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 ● Initiates and completes a QI project to improve county referrals to bone health for patients with distal radius fractures in collaboration with the county health department and shares results with stakeholders
Assessment Models or Tools	● Direct observation ● E-module multiple choice tests ● Medical record (chart) audit ● Multisource feedback ● Portfolio ● Reflection ● Simulation
Curriculum Mapping	●
Notes or Resources	● Institute of Healthcare Improvement website. http://www.ihi.org/Pages/default.aspx. Note: Includes multiple choice tests, reflective writing samples, and more

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 an insufficiency 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 interprofessional team members* *Performs safe and effective transitions of care/hand-offs in straightforward clinical situations*	● Coordinates transition of care with home intravenous antibiotic therapy at the time of discharge from the hospital ● Ensures post-hospitalization appointments are scheduled and therapeutic aftercare is coordinated ● Uses a systematic institutional process during routine sign-out
Level 3 *Coordinates care of patients in complex clinical situations effectively using the roles of interprofessional team members* *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 aftercare ● Uses institutional protocol when transferring a replantation patient to the intensive care unit (ICU)
Level 4 *Teaches effective coordination of patient-centered care among multidisciplinary teams* *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 who needs therapeutic aftercare ● Teaches physician assistants, more junior residents, and others ● 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 lawnmower/snowblower safety plan ● Develops a protocol (care pathways for various hand surgery conditions) to improve transitions to long-term care facilities
Assessment Models or Tools	● Direct observation

	● Multisource feedback ● 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. ● Health Research and Educational Trust. *Preventing Patient Falls: A Systematic Approach from the Joint Commission Center for Transforming Healthcare Project*. Chicago: Health Research and Educational Trust; 2016. http://www.hpoe.org/Reports-HPOE/2016/preventing-patient-falls.pdf. Accessed 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. Accessed 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 hand therapy access for individual patients
Level 3 *Analyzes how personal practice affects the system (e.g., length of stay, readmission rates, clinical efficiency)*	● Monitors length of stay to ensures compliance with care pathways ● Increases patient education to decrease 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 affects 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.

	● The Commonwealth Fund. Health system data center. 2019. http://datacenter.commonwealthfund.org/?_ga=2.110888517.1505146611.1495417431-1811932185.1495417431#ind=1/sc=1 . Accessed 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/. Accessed 2021. ● The Kaiser Family Foundation. www.kff.org. Accessed 2021. ● The Kaiser Family Foundation. Health reform. https://www.kff.org/topic/health-reform/. Accessed 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 to the care of a straightforward condition*	● Identifies American Academy of Orthopaedic Surgeons Clinical Practice Guidelines for treatment of a distal radius fracture; compares to the patient's preference for treatment while communicating and understanding options
Level 2 *Articulates clinical questions and elicits patient preferences and values to guide evidence-based care*	● Identifies and discusses potential evidence-based treatment options for a patient with a displaced distal radius 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 distal radius 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 distal radius fracture based on bone quality. (e.g., external versus internal fixation versus closed reduction and pinning versus cast treatment)
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 distal radius fractures ● Develops an osteoporosis screening and referral protocol 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. AO surgery reference. https://surgeryreference.aofoundation.org/ ● National organization guidelines, e.g., American Academy of Orthopaedic Surgeons, American Osteopathic Association, ● Various academic journals, e.g., *Journal of the American Academy of Orthopaedic Surgeons*, *Journal of Hand Surgery*, *HAND*)

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 ASSH Self-Assessment exam ● Reflects on feedback from patient care team members ● Completes a self-assessment ● Identifies gaps in knowledge
Level 2 *Demonstrates openness to feedback and other input 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 ● Reflects on self-assessment and adapts study plan
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 members ● Uses results from the ASSH Self-Assessment exams 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	● Core conference participation

	● Direct observation ● Multisource feedback ● 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. Accessed 2021. ● Hojat M, Veloski JJ, Gonnella JS. Measurement and correlates of physicians' lifelong learnig. *Academic Medicine*. 2009;84(8):1066-1074. https://journals.lww.com/academicmedicine/fulltext/2009/08000/Measurement_and_Correlates_of_Physicians__Lifelong.21.aspx. Accessed 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. Accessed 2021.

Professionalism 1: Professional Behavior and Ethical Principles **Overall Intent:** To recognize and address lapses in ethical and professional behavior, demonstrate 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 or deficiencies* *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* *Applies 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 professional deficiencies and intervenes to prevent lapses in oneself 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 ● Responds to inappropriate microaggressions ● 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 ● Recognizes source of repetitive conflict between members of health care team and recommends institutional policy to resolve

Identifies and seeks to address system-level factors that induce or exacerbate ethical problems or impede their resolution	● 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. Accessed 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. Accessed 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. Accessed 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. Accessed 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 *Performs tasks and responsibilities in a timely manner with appropriate attention to detail in routine situations* *Responds promptly to requests or reminders to complete tasks and responsibilities*	● Completes work hour logs without prompting ● Has timely attendance at conferences ● Completes medical records in a timely fashion ● Completes end-of-rotation evaluations
Level 2 *Performs tasks and responsibilities in a timely manner with appropriate attention to detail in complex or stressful situations* *Identifies potential contributing factors, and describes strategies for ensuring timely task completion in the future*	● Completes administrative tasks, documents safety modules, procedure review, and licensing requirements by specified due date ● Triages and addresses both patient and institutional responsibilities while on call ● Before going out of town, completes tasks in anticipation of lack of computer access while traveling
Level 3 *Delegates some tasks or responsibilities in routine situations* *Recognizes situations that may impact one's own or others' ability to complete tasks and responsibilities in a timely manner in routine situations*	● Notifies attending of multiple competing demands on call, appropriately triages tasks, and asks for assistance from residents, other fellows, or faculty members as needed ● In preparation for being out of the office, arranges coverage for assigned clinical tasks and ensures appropriate continuity of care
Level 4 *Delegates some tasks or responsibilities in complex or stressful situations* *Recognizes situations that may impact one's own or others' ability to complete tasks and responsibilities in a timely manner in complex or stressful situations*	● Takes responsibility for inadvertently omitting key patient information during sign-out and professionally discusses with the patient, family members, and interprofessional team ● Manages complex patient care scenarios including a replantation surgery by being able to delegate tasks to the care team to optimize patient care ● When a call case runs into the next day, anticipates conflicts and adjusts responsibilities accordingly through notifying the care team or delegating responsibilities
Level 5 *Teaches concepts of or counsels others on accountability or conscientiousness in the workplace*	● Educates new members of the team on importance of communication with the social worker to prevent delays in discharge

On a departmental or system-wide level, advocates to improve systems that ensure patients' needs are met within the hospital, upon discharge, and in follow-up	● Participates in or leads quality improvement projects focused on systems issues that impact patient care
Assessment Models or Tools	● Compliance with deadlines and timelines ● Direct observation ● Global evaluations ● Multisource feedback ● Self-evaluations and reflective tools ● Simulation
Curriculum Mapping	●
Notes or Resources	● Code of conduct from fellow institutional manual ● Expectations of fellowship 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 ● Lists how to integrate best practices for improving well-being into their career
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 resources both within and outside of their institution that could promote wellness ● Lists graduate medical education (GME) counseling services, suicide hotline information, 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 ● Discusses plans for integration of wellness focused activities to their practice ● 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*	● Independently identifies ways to manage personal stress and responses to unexpected patient outcomes ● Independently initiates a personal wellness plan ● Identifies initiatives within the fellowship 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 fellow well-being within the program ● Models a balanced lifestyle that prioritizes wellness
Assessment Models or Tools	● 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. Accessed 2022. ● 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. Accessed 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. Accessed 2021. ● Hicks, Patricia J., Daniel Schumacher, Susan Guralnick, Carol Carraccio, and Ann E. Burke. 2014. “Domain of Competence: Personal and Professional Development.” Academic Pediatrics 14(2 Suppl): S80-97. https://www.sciencedirect.com/science/article/abs/pii/S187628591300332X. ● Local resources, including Employee Assistance Programs

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 patients and their families (e.g., situational awareness of language, disability, health literacy level)*	● 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 the informed consent process	● Outlines basic risks, benefits, and alternatives to surgery
Level 2 *Establishes a therapeutic relationship in straightforward encounters*	● Uses patient-centered communication when answering questions during the informed consent process
Identifies barriers to effective communication (e.g., health literacy)	● 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 seeks an attending if questions arise that are beyond the fellow'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)*	● Avoids medical jargon and restates patient perspective when discussing a diagnosis and treatment options of a simple fracture or hand condition ● 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; e.g., after an active middle-aged patient states a desire to continue heavy weightlifting despite scapholunate advanced collapse wrist and physician bias about lifting activities on wrist pain and arthritis
Counsels patients through the decision-making process for straightforward conditions	● Discusses indications, risks, benefits, and alternatives during informed consent for a distal radius fracture including a discussion of short- and long-term patient functional outcomes

Level 4 *Facilitates difficult discussions to patients and their families, (e.g., explaining complications, therapeutic uncertainty)*	● Counsels representative family members in the care of a patient with dementia and a distal radius fracture when some family members desire surgery and others do not
Recognizes biases and integrates the patient's viewpoint and autonomy to ensure effective communication	● Discusses an active elderly patient's goal of strength training after total wrist arthroplasty despite bias and risks of lifting activities on a wrist replacement; includes identification of risks, benefits, and long-term effects of heavy lifting and a treatment plan to achieve the patient's goal
Counsels patients through the decision-making process for complex conditions	● Discusses indications, risks, benefits, and alternatives during informed consent for distal radius 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 distal radius fracture patients with dementia
Mentors others in situational awareness and critical self-reflection	● Encourages others to take the Implicit Bias Test (link in Resources) and leads a discussion about impact of bias in residency ● Observes interactions between residents and patients and offers constructive feedback
Counsels patients through the decision-making process for uncommon conditions	● Serves on a hospital bioethics committee ● Develops supplemental materials to better inform patients prior to arthroplasty ● Counsels patient's family about treatment options for a congenital hand deformity
Assessment Models or Tools	● Direct observation ● Simulation ● 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. Accessed 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/. Accessed 2021. ● Project Implicit. https://implicit.harvard.edu/implicit/takeatest.html. Accessed 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. Accessed 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 a radiology tech regarding x-ray orders, understanding the radiology tech plays in important role in care of the hand surgery 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 and assists with limb positioning if requested by the tech ● Communicates with the emergency department physician a diagnosis of evolving compartment syndrome and the 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 amputated upper extremity, dysvascular hand, 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*	● Organizes a multidisciplinary conversation to alleviate conflict following treatment of a patient with an amputated upper extremity part, dysvascular hand, unstable pelvis fracture, femur fracture, and multiple visceral injuries ● Attends medical rounds to review consult findings about the possible deep space infection of the hand and provides education of the medical team about evaluation of a hand infections
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	● Direct observation ● Global assessment ● Multisource feedback ● Simulation
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/. Accessed 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. Accessed 2021. ● Green M, Parrott T, Cook G., Improving your communication skills. *BMJ* 2012;344. https://www.bmj.com/content/344/bmj.e357. Accessed 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/. Accessed 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/. Accessed 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/. Accessed 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 Health Insurance Portability and Accountability Act (HIPAA) compliance with all communications
Level 2 *Demonstrates accurate, timely, and efficient use of the 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 a mangled extremity or amputated part including risks, benefits, and alternatives ● Obtains outside records including prior implant records ● Tells 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 mangled upper extremity or amputated part including surgical priorities and implants/supplies/instruments needed ● Triages and communicates time urgency of treatment of a polytrauma 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	● 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. Accessed 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. Accessed 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. Accessed 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: Acquired Conditions	PC5: Elective (Acquired and Congenital)
PC2: Arthritis	PC3: Arthritis
PC3: Congenital	PC5: Elective (Acquired and Congenital)
PC4: Nerve	PC4: Nerve
PC5: Trauma: Bone, Joint	PC1: Traumatic Bone and Joint Injury
PC6: Soft Tissue Trauma, Infections	PC2: Soft Tissue Trauma
PC7: Tendon	No match
MK1: Acquired Conditions	No match
MK2: Arthritis	No match
MK3: Congenital	No match
MK4: Nerve	No match
MK5: Trauma: Bone, Joint	No match
MK6: Soft Tissue Trauma, Infections	No match
MK7: Tendon	No match
No match	MK1: Clinical Decision Making
No match	MK2: Anatomy and Physiology of Hand Conditions
No match	MK3: Diagnostics
No match	MK4: Rehabilitation
SBP1: Patient Safety, Resource Allocation, Practice Management	SBP1: Patient Safety and Quality Improvement SBP3: Physician Role in the Health Care Systems
No match	SBP2: System Navigation for Patient-Centered Care
PBLI1: The ability to investigate and evaluate the care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and lifelong learning	PBLI1: Evidence-Based and Informed Practice PBLI2: Reflective Practice and Commitment to Personal Growth
PROF1: Ethics and Values	PROF1: Professional Behavior and Ethical Principles PROF3: Self-Awareness and Help-Seeking
No match	PROF2: Accountability/Conscientiousness

ICS1: Interpersonal and Communication Skills	ICS1: Patient- and Family-Centered Communication ICS2: Interprofessional and Team Communication ICS3: Communication within Health Care Systems

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/