Supplemental Guide: Epilepsy

ACGME

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Milestones Supplemental Guide

This document provides additional guidance and examples for the Epilepsy 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.

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: History **Overall Intent:** To efficiently obtain, communicate, and document an epilepsy specific history	
Milestones	**Examples**
Level 1 *Obtains a relevant and organized seizure history and interval history, including from external sources*	● Obtains a detailed description of the seizure semiology including localizing and lateralizing signs ● Obtains the age of seizure onset, seizure frequency, longest seizure free interval, seizure duration, and longest seizure duration ● Interviews all relevant sources including the patient, family members, and other witnesses
Level 2 *Obtains a relevant and organized history, recognizing seizure risk factors, seizure mimics, and adverse treatment effects*	● Obtains history regarding febrile seizures, intracranial infections, stroke, head trauma, and seizures in other family members ● Asks about seizure triggers and diurnal patterns ● Asks about common adverse effects of antiseizure medications including those unique to each medication ● Discusses risk factors for sudden unexpected death in epilepsy (SUDEP)
Level 3 *Efficiently obtains a relevant and organized history, including neuropsychiatric symptoms, relevant to patient's acuity and clinical setting (e.g., clinic, emergency room)*	● For patients in the emergency department, uses a focused history to determine a potential reason for an acute exacerbation of seizures such as poor adherence to the medical regimen, illness, or sleep deprivation ● Uses screening tools for depression, anxiety, and neurocognitive dysfunction
Level 4 *Consistently obtains a history sufficient to guide subsequent examination, investigation, and treatment in complex cases, including unusual causes of seizures and epilepsy*	● Obtains history necessary to assess if a patient has drug-responsive or drug-resistant epilepsy and to recommend the best treatment option to consider for those with drug-resistant epilepsy whether surgery, neurostimulation, or dietary therapy ● Obtains history necessary to assess for the possibility of an autoimmune epilepsy or a specific genetic or metabolic epilepsy
Level 5 *Serves as a role model for obtaining a neurological history related to seizures and epilepsy*	● Teaches medical students, residents, physician extenders, and non-neurologists how to obtain a seizure history
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit
Curriculum Mapping	●
Notes or Resources	● Patel AD, Baca C, Franklin G, et al. Quality improvement in neurology: Epilepsy Quality Measurement Set 2017 update. *Neurology*. 2018;91(18):829-836. https://pubmed.ncbi.nlm.nih.gov/30282773/. 2020.

	● Sirven JI. Diagnosing and localizing seizures at the bedside and in clinic. In: Miller JW, Goodkin HP. *Epilepsy (NIP – Neurology in* Practice). West Sussex, UK: John Wiley & Sons; 2014: 35-41. ISBN:978-1118456941.

Patient Care 2: Neurologic Examination **Overall Intent:** To efficiently obtain, communicate, and document a developmentally appropriate and epilepsy-focused physical examination	
Milestones	**Examples**
Level 1 *Performs a complete neurologic examination, including a relevant systemic and treatment side-effect examination*	● Identifies neurological examination findings associated with a patient's underlying epilepsy ● Recognizes clinical examination findings associated with antiseizure medications and or surgical interventions
Level 2 *Performs a complete neurologic examination accurately, incorporating all maneuvers (e.g., hyperventilation) appropriate to the patient, and relevant screening for psychiatric comorbidities*	● Recognizes abnormalities associated with epilepsy related disorders and epilepsy syndromes ● Performs appropriate maneuvers such as hyperventilation in the appropriate clinical setting ● Utilizes objective measures for assessment of underlying psychiatric illnesses such as Beck depression inventory (BDI) etc. ● Performs appropriate examination in the ictal and post ictal state
Level 3 *Consistently performs a complete neurologic examination to efficiently guide and prioritize subsequent investigation and treatment*	● Recognizes stigmata of neurocutaneous and other systemic disorders associated with epilepsy ● Identifies abnormalities associated with genetic and or metabolic syndromes ● Correlates clinical findings with additional data including imaging, electroencephalography (EEG), and laboratory studies ● Correlates clinical examination findings in the ictal and post ictal state with localization of the seizure focus
Level 4 *Performs a neurologic and systemic examination to identify unusual and rare causes of seizures or epilepsy*	● Recognizes clinical features of rare and unusual neurological disorders and identifies appropriate diagnostic tools for assessment ● Identifies rare examination findings including retinal abnormalities associated with underlying disease or treatment
Level 5 *Serves as a role model for performing a complete and relevant neurologic and systemic examination of patients with seizures and epilepsy*	● Teaches medical students, residents, non-neurologists, and advanced practice providers relevant techniques and nuances of the neurological examination relevant to the patient with epilepsy
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Simulation
Curriculum Mapping	●
Notes or Resources	● DeMyer WE. *Technique of the Neurological Examination*. 5th ed. New York; NY: McGraw Hill; 2004. ● Engel J, Pedley T, Aicardi J, Dichter MA, Peruca E. *Epilepsy: A Comprehensive Textbook*. 2nd ed. LWW; 2008: 287- 788.

	● Larsen PD, Stensaas SS. PediNeurologic Exam: A Neurodevelopmental Approach. https://neurologicexam.med.utah.edu/pediatric/html/home_exam.html. 2020.

Patient Care 3: Medical Management **Overall Intent:** To effectively diagnose and manage epilepsy and its comorbidities medically using pharmacological and non-pharmacological treatments	
Milestones	**Examples**
Level 1 *Provides anti-seizure medication treatment for patients with common seizure disorders* *Manages common side-effects of pharmacologic therapy*	● Understands which antiseizure medications are appropriate selections for partial and generalized epilepsies ● Understands difference in drug formulations ● Describes life-threatening antiseizure medication adverse effects
Level 2 *Provides anti-seizure medication treatment for patients with uncommon seizure disorders, incorporating genetic background, age, gender, and relevant demographic variables* *Manages pharmacokinetics and drug interactions of anti-seizure medications*	● Avoids use of valproic acid in young females ● Avoids use of sodium blockers in patients with sodium channel neuronal type 1α subunit (SCN1A) mutations ● Adjusts doses and dosing frequency by age and metabolism ● Understands the interaction between antiepileptic medications and other medications
Level 3 *Provides anti-seizure medications for special circumstances such as pregnancy and underlying medical complications* *Identifies uncommon and rare side-effects of pharmacologic therapy*	● Understands the relative risks of antiseizure medications during pregnancy and their impact on the fetus ● Adjusts antiseizure medications dosing and frequency for a patient on dialysis ● Changes antiseizure medications appropriate for chemotherapy ● Orders visual field testing for patients taking vigabatrin
Level 4 *Provides medical management, including nonpharmacologic treatments, of patients with seizure disorders* *Manages uncommon anti-seizure medications, rare side-effects of pharmacologic therapy and complex drug interactions*	● Manages treatment with dietary therapies ● Adjusts dosing for patients on antiseizure medications with multiple drug interactions
Level 5 *Engages in scholarly activity (e.g., teaching, participating in clinical trials, authorship) related to medical management of patients with seizure disorders*	● Presents abstract on efficacy of antiseizure medications at a national meeting

Assessment Models or Tools	● Direct observation ● Medical record (chart) audit
Curriculum Mapping	●
Notes or Resources	● Glauser T, Ben-Menachem E, Bourgeois B, Cnaan A, et al. Updated ILAE evidence review of antiepileptic drug efficacy and effectiveness as initial monotherapy for epileptic seizures and syndromes. *Epilepsia*. 2013;54(3):551-563. https://pubmed.ncbi.nlm.nih.gov/23350722/. 2020. ● Patsalos PN, Berry DJ, Bourgeois BFD, et al. Antiepileptic drugs – best practice guidelines for therapeutic drug monitoring: A position paper by the subcommision on therapeutic drug monitoring, ILAE Commission on Therapeutic Strategies. *Epilepsia*. 2008;49(7):1239-1276. https://pubmed.ncbi.nlm.nih.gov/18397299/. 2020. ● Porter RL, Rogawski MA. Antiseizure Drugs. In: Katzung B. *Basic and Cllincal Pharmacology*. 14th edition. McGraw-Hill; 2017.

Patient Care 4: Surgical Management of the Inpatient Setting **Overall Intent:** To efficiently obtain, communicate, and document a developmentally appropriate knowledge and skill that addresses epilepsy surgical management	
Milestones	**Examples**
Level 1 *Discusses the indications for and different types of surgical intervention and identifies appropriate epilepsy surgery candidates*	● Understands and verbalizes the indications for temporal lobectomy, neocortical resection, corpus callosotomy ● Describes the risks and benefits of epilepsy surgery ● Understands and identifies appropriate epilepsy surgery candidate
Identifies all approved medical device therapies	● Understands and identifies vagus nerve stimulation, responsive neurostimulation, and deep brain stimulation for drug-resistant epilepsy
Educates patients and caregivers regarding epilepsy surgery indication and understands the role of the epilepsy surgery conference	● Educates and counsels patients and caregivers regarding epilepsy surgery indications and epilepsy surgery evaluation such as temporal lobectomy, medical devices, etc. ● Understands and verbalizes the role of the epilepsy surgery conference
Level 2 *Identifies and interprets diagnostic modalities for epilepsy surgery evaluation (Phase I)*	● Identifies and understands video-EEG monitoring in epilepsy monitoring unit, magnetic resonance imaging (MRI) for epilepsy protocol, fluorodeoxyglucose positron emission tomography (FDG PET), single-photon emission computed tomography (SPECT), magnetoencephalography (MEG), source localization/ dipole analysis, Wada, neuropsychology testing, psychosocial evaluation ● Interprets Phase I video-EEG monitoring and generates preliminary reports
Discusses age-dependent indications for and limitations of all approved device therapies	● Understands and discusses age-dependent indications for and limitations of vagus nerve stimulation, responsive neurostimulation, and deep brain stimulation
Educates patients and caregivers regarding overall epilepsy surgery risks and benefits and participates in epilepsy surgery conference	● Educates and counsels patients and caregivers regarding epilepsy surgery risks, benefits, and prognosis of proposed epilepsy surgery plan ● Attends epilepsy surgery conference and presents patient's data in a straightforward manner under direct supervision of faculty member(s)
Level 3 *Plans all aspects of the Phase I surgical evaluation and recognizes and interprets common findings of diagnostic modalities (intracranial electroencephalogram (EEG), functional mapping with cortical stimulation, imaging merge and fusion)*	● Plans when FDG PET, SPECT and/or MEG is needed ● Interprets common findings of and generates preliminary reports for electroencephalogram with intracranial electrode placement and/or post-resection, intracranial video-EEG monitoring, and functional mapping with cortical stimulation ● Understands and interprets imaging merge and fusion after radiology personnel completes the procedures

Interrogates medical device therapies with simple programming *Collaborates with the interdisciplinary team, including patient and family, in acute post-operative management and presents Phase I data as part of the epilepsy surgery conference*	● Interrogates medical devices and performs simple programming such as turning on/off and simple increase of current ● Collaborates and coordinates care with patient, family members, and other medical staff members (nurse, EEG technologist, and neurology/ neurosurgery residents) in epilepsy monitoring unit and post-operative cases ● Presents complete Phase I data under indirect supervision of faculty member(s)
Level 4 *Plans all aspects of the Phase II surgical evaluation including less common findings* *Interprets data and programs approved medical devices as well as troubleshoots technical issues* *Collaborates with the interdisciplinary team in long-term surgical management and presents Phase II data*	● Plans when stereo electroencephalography (sEEG) versus subdural grid is needed for Phase II ● Interprets less common findings and generates full reports of EEG, intracranial video-EEG monitoring, and functional mapping with cortical stimulation ● Interprets data of detected event trends in medical device and programs the device with common recommended algorithm ● Troubleshoots technical issues and understands when the revision is needed in device therapy ● Coordinates care with interdisciplinary team (neurologist, neurosurgeon, primary care provider, etc.) in long-term epilepsy surgical management ● Presents complete Phase II data under indirect supervision of faculty member(s)
Level 5 *Independently plans and manages Phase II surgical evaluation and engages in scholarly activity (e.g., conducts research, publishes in peer-reviewed journal) related to surgical management of patients with refractory seizure disorder* *Independently manages and programs all approved medical devices including complex programming* *Leads multidisciplinary epilepsy surgery team and epilepsy surgery conference*	● Independently plans the coverage of Phase II electrodes (either with sEEG or subdural grid) and directs Phase II surgical evaluation such as laser interstitial thermal therapy, open resection, or medical device therapy ● Engages in research, manuscript writing, or a regional or national conference related to surgical management of patients with refractory seizure disorder ● Understands and performs complex programming such as group bipolar or low-frequency stimulation in responsive neurostimulation ● Leads and coordinates projects in multidisciplinary epilepsy surgery team
Assessment Models or Tools	● Direct observation – clinical care environment ● Direct observation – epilepsy surgery multidisciplinary conference ● Written examination
Curriculum Mapping	●

Notes or Resources	● Engel J Jr. What can we do for people with drug-resistant epilepsy? The 2016 Wartenberg Lecture. *Neurology.* 2016;87(23):2483-2489. https://pubmed.ncbi.nlm.nih.gov/27920283/. 2020. ● Engel J, McDermott MP, Wiebe S, et al. Early surgical therapy for drug-resistant temporal lobe epilepsy: A randomized trial. *JAMA*. 2012;307(9):922-930. https://pubmed.ncbi.nlm.nih.gov/22396514/. 2020. ● Weibe S, Blume WT, Girvin JP, Eliasziw M. A randomized, controlled trial of surgery for temporal-lobe epilepsy. *N Engl J Med*. 2001;345(5):311-318. https://pubmed.ncbi.nlm.nih.gov/11484687/. 2020. ● Wyllie E, Gidal BE, Goodkin HP, Loddenkemper T, Sirven JI. *Wyllie's Treatment of Epilepsy: Principles and Practice*. 7th edition. Philadelphia, PA: Wolters Kluwer; 2021.

Patient Care 5: Emergent and Critical Care **Overall Intent:** To understand the indication for critical care EEG monitoring, efficiently and accurately interpret continuous EEG findings, and manage critically ill patients in collaboration with critical care team	
Milestones	**Examples**
Level 1 *Recognizes the indications for continuous EEG monitoring in critically ill patients and identifies primary and secondary causes of status epilepticus* *Performs and interprets a diagnostic evaluation for a patient with status epilepticus*	● Understands when continuous EEG monitoring is indicated for critically ill patients ● Identifies high-risk patients for status epilepticus ● Identifies primary and secondary cause of status epilepticus ● Communicates EEG findings with the patient care team ● Understands critical care EEG terminology and definition of status epilepticus
Level 2 *Recognizes and interprets continuous EEG monitoring data in patients with convulsive and non-convulsive status epilepticus and identifies common artifacts in intensive care unit (ICU) EEGs* *Recognizes common drug interactions and life-threatening complications of anti-seizure medications*	● Writes continuous EEG reports using the standardized intensive care unit (ICU) EEG terminology ● Identifies eye movements, breach rhythms, EEG electrodes, and electrocardiogram (EKG) as artifacts in ICU EEGs ● Understands common drug interactions between antiseizure medications and other drugs ● Identifies propofol infusion syndrome
Level 3 *Recognizes and interprets continuous EEG monitoring data in patients with acute neurologic problems and identifies uncommon artifacts in ICU EEGs* *Identifies and manages critically ill patients with refractory and super refractory status epilepticus*	● Applies EEG findings to patients' acute neurologic problems, and communicates with the primary team about EEG's clinical implications and formulate treatment plans accordingly ● Actively manages or engages in management of critically ill patients with refractory and super refractory status epilepticus ● Identifies bed percussion artifacts, ventilator artifacts, water in the tube artifacts, and pulse artifacts
Level 4 *Interprets and manages critically ill patients with continuous EEG monitoring, including quantitative EEG* *Collaborates with the interdisciplinary team and manages neurological complications in critically ill patients including refractory and super refractory status epilepticus*	● Applies quantitative EEG for long-term trends, quantifies burden of seizures/status epilepticus, and monitors therapeutic effects of medications ● Leads the interdisciplinary team in joint ICU-EEG conferences and discusses EEG findings, diagnosis, and treatments for critically ill patients ● Teaches residents, nurses, and technicians about continuous EEG findings and quantitative EEGs and their implications in clinical care

Level 5 *Engages in scholarly activity (e.g., publishes in peer-reviewed journal) related to emergent management of patients with cluster of seizures or status epilepticus*	● Applies evidence-based medicine with self-initiated literature search in critical care EEG monitoring and management ● Engages in research projects, presents poster, or publishes in peer-reviewed journal related to critical care EEG or management of critically ill patients
Assessment Models or Tools	● Assessment during case conferences ● Direct observation ● Medical record (chart) audit ● Written examination
Curriculum Mapping	●
Notes or Resources	● Hirsch LJ, LaRoche SM, Gaspard N, et al. American Clinical Neurophysiology Society's Standardized Critical Care EEG Terminology: 2012 version. *J Clin Neurophysiol*. 2013:30(1):1-27. https://pubmed.ncbi.nlm.nih.gov/23377439/. 2020. ● LaRoche S, Haider HA. *Handbook of ICU EEG monitoring*. 2nd edition. New York, NY: Springer Publishing Company; 2018. ● Nelson SE, Varelas PN. Status epilepticus, refractory status epilepticus, and super-refractory status epilepticus. *Continuum (Minneap Minn).* 2018;24(6):1683-1707. https://pubmed.ncbi.nlm.nih.gov/30516601/. 2020. ● Young GB, Mantia J. Continuous EEG monitoring in the intensive care unit. *Handb Clin Neurol*. 2017;140:107-116. https://pubmed.ncbi.nlm.nih.gov/28187794/. 2020.

Patient Care 6: Cognitive, Behavioral, and Psychiatric Disorders Associated with Epilepsy **Overall Intent:** To recognize cognitive, behavioral, and psychiatric disorders associated with epilepsy and determine effective therapies	
Milestones	**Examples**
Level 1 *Identifies cognitive, behavioral, and psychiatric disorders in patients with epilepsy or psychogenic non-epileptic seizures*	● Recognizes depression, memory disorders, cognitive impairment, and psychiatric disorders may co-exist in patients with either epilepsy or psychogenic non-epileptic seizures ● Recognizes that some medications used to treat either epilepsy or psychogenic non-epileptic seizures may contribute to cognitive and behavior disorders in these patients ● Communicates with patient and family the type and degree of comorbidities
Level 2 *Discusses the contribution of seizures, epilepsy etiology, treatment (e.g., anti-seizure medications, surgery), and other factors (e.g., sleep disorder) to cognitive, behavioral, and psychiatric disorders in patients with epilepsy or psychogenic non-epileptic seizures*	● Recognizes the consequences of frequent seizures and different seizure types on cognition and memory ● Understand the association of epilepsy and antiseizure medications with suicidal ideations and suicide attempts ● Recognizes risk factors for suicide in adults and children
Level 3 *Diagnoses and manages common cognitive, behavioral, and psychiatric disorders medically and refers for neuropsychological testing and psychological or psychiatric treatment, as appropriate*	● Screens for depression in patients with epilepsy ● Refers patients with potential for memory impairment for appropriate neuropsychological testing ● Recognizes that psychogenic non-epileptic seizures may be exacerbated by underlying psychiatric conditions requiring medical management ● Refers patients with psychogenic non-epileptic seizures for cognitive behavioral therapy ● Selects antidepressant medications for uncomplicated depression ● Identifies antidepressant, antianxiety, and antipsychotic medications that may exacerbate seizures
Level 4 *Uses community resources and collaborates with other mental health providers and families to manage cognitive, behavioral, and psychiatric disorders in patients with epilepsy or psychogenic non-epileptic seizures*	● Refers patients with cognitive, behavioral, and psychiatric disorders associated with seizures to appropriate practitioners in the community with focused expertise in the specific comorbidity ● Knows local private, non-profit, and government resources to refer patients with psycho-social needs ● Develops methods to jointly follow patients with epilepsy or psychogenic non-epileptic disorders with psychologists or psychiatrists
Level 5 *Engages in scholarly activity (e.g., teaching, research, authorship) in cognitive, behavioral, or psychiatric disorders*	● Engage in multidisciplinary review of evidence-based treatment with neuropsychology and psychiatry colleagues to establish local, national, or international assessment and treatment guidelines
Assessment Models or Tools	● Assessment during case conferences ● Chart audit

	● Direct observation
Curriculum Mapping	●
Notes or Resources	● Baslet G, Bajestan SN, Aybek S, et al. Evidence-based practice for the clinical assessment of psychogenic nonepileptic seizures: A report from the American Neuropsychiatric Association Committee on Research. *J Neuropsychiatry Clin Neurosci*. 2020. https://pubmed.ncbi.nlm.nih.gov/32778006/. 2020. ● Leeman-Markowski BA, Schachter SC. Psychiatric comorbidity of epilepsy. In: Wyllie E. *Treatment of Epilepsy: Principles and Practice*. 7th ed. Philadelphia, PA: Wolters Kluwer, 2021: 1064-1084.

Patient Care 7: Read and Interpret Electroencephalogram (EEG) **Overall Intent:** To demonstrate the ability to interpret and report EEG findings in the context of clinical care across the age spectrum	
Milestones	**Examples**
Level 1 *Identifies normal EEG as a function of age* *Verbally describes the findings of an EEG study*	● Identifies normal features of wakefulness and sleep while reading a routine EEG ● Provides a verbal summary of the findings of a normal routine EEG
Level 2 *Identifies features of the normal EEG at all developmental stages, as well as artifacts* *Writes a complete report of a routine EEG study*	● Correctly identifies periods of wakefulness, active sleep, and quiet sleep in a full-term infant ● Completes the preliminary report for an inpatient routine EEG
Level 3 *Recognizes interictal epileptiform abnormalities, benign non-epileptiform transients, and ictal patterns, and correlates these patterns with observed semiology on video* *Writes a complete daily report for a continuous video-EEG study including (when applicable) a detailed semiologic description*	● Provides a complete description of a focal seizure beginning with left temporal rhythmic theta frequency activity evolving to broader left hemispheric delta frequency activity and then ceasing and correlates that with a semiology of oral automatisms and speech/behavioral arrest ● Completes the preliminary report for a day of continuous video-EEG monitoring
Level 4 *Teaches others to identify normal and abnormal features of an EEG* *Teaches others to report EEG findings in verbal and written formats*	● Leads a lecture to one or more residents describing epileptiform abnormalities using examples from EEGs or video-EEGs recorded during that rotation ● Reviews and provides feedback on a written report of a routine EEG study from a resident
Level 5 *Engages in scholarly activity focusing on the interpretation of EEG*	● Develops a project investigating the utility of a novel quantitative approach to EEG screening
Assessment Models or Tools	● Assessment during case conferences ● Direct observation ● Medical record (chart) audit ● Written examination
Curriculum Mapping	●
Notes or Resources	● Fisch BJ, Spehlmann R. *Fisch and Spehlmann's EEG primer: Basic Principles of Digital and Analog EEG*. 3rd ed. Amsterdam: Elsevier; 1999. ● Libenson MH. *Practical Approach to Electroencephalography*. 1st ed. Philadelphia, PA: Saunders/Elsevier; 2010.

	● Schomer DL, Lopes da Silva FH. Niedermeyer's Electroencephalography: Basic Principles, Clinical Applications, and Related Fields. 7th ed. New York, NY: Oxford University Press; 2018. ● St. Louis EK, Frey LC, Britton JW, et al. *Electroencephalography (EEG): An Introductory Text and Atlas of Normal and Abnormal Findings in Adults, Children, and Infants*. Chicago, IL: American Epilepsy Society; 2016. https://www.ncbi.nlm.nih.gov/books/NBK390354/. 2020.

Medical Knowledge 1: Epilepsy Localization **Overall Intent:** To precisely localize focal seizure onset and network using the history, physical exam, EEG, imaging, and neuropsychological testing	
Milestones	**Examples**
Level 1 *Describes typical semiology of seizures originating in each lobe and the potential neurological deficits based on lobe of origin*	● Recognizes characteristics of temporal lobe seizures including psychic sensations, epigastric sensations, motor automatisms, and impaired awareness ● Recognizes characteristics of frontal lobe seizures including hypermotor activity, short duration, and occurrence during sleep
Level 2 *Predicts lobar location of the seizure focus based on history (e.g., seizure semiology), exam findings, interictal EEG, and anatomical magnetic resonance imaging (MRI)*	● Understands that hypermotor seizures in association with a normal exam, normal EEG, and normal MRI are consistent with frontal lobe seizures ● Recognizes that insular seizures can have overlapping semiology with frontal and temporal lobe seizures
Level 3 *Uses detailed knowledge of neuroanatomy and neurophysiology along with clinical data (e.g., seizure semiology, neuropsychological testing, positron emission tomography (PET) scans) to determine the location of the seizure focus within a lobe*	● Uses seizure semiology and ictal EEG to distinguish between mesial and neocortical temporal lobe epilepsy ● Understands the use of FDG PET or ictal SPECT in localizing frontal lobe epilepsy
Level 4 *Uses detailed knowledge of neuroanatomy, neural networks, and neurophysiology along with incongruent clinical data (e.g., seizure semiology, neuropsychological testing, PET scans) to develop a plan for intracranial recording and potential surgical options*	● Devises a stereo-EEG plan to determine the contribution of medial and lateral temporal area, anterior cingulate, orbitofrontal cortex, and insula in a patient with mesial temporal sclerosis but with a seizure semiology and EEG findings suggesting an extrahippocampal onset ● Develops a stereo-EEG plan to investigate the frontoparietal network in a non-lesional patient having a seizure semiology consistent with a frontal onset and an FDG PET scan showing hypometabolism in the parietal area
Level 5 *Participates in scholarly activity (e.g., teaching, research, authorship) related to localization of epileptic focus*	● Teaches medical students, residents, physician extenders, and non-neurologists how to localize seizures ● Gives lectures at conferences on how to plan a stereo-EEG study
Assessment Models or Tools	● Case conference ● Direct observation ● Written examination
Curriculum Mapping	●
Notes or Resources	● Alomar S, Jones J, Maldonado A, Gonzalez-Martinez J. The stereo-electroencephalography methodology. *Neurosurg Clin N Am.* 2016,27:83-95. https://pubmed.ncbi.nlm.nih.gov/26615111/. 2020.

	● Bonini F, McGonigal A, Trébuchon A, et al. Frontal lobe seizures: From clinical semiology to localization. *Epilepsia*. 2014,55:264-277. https://pubmed.ncbi.nlm.nih.gov/24372328/. 2020. ● Kennedy JD, Schuele SU. Neocortical temporal lobe epilepsy. *J Clin Neurophysiol*. 2012,29:366-370. https://pubmed.ncbi.nlm.nih.gov/23027092/. 2020. ● Kalamangalam GP, Tandon N. Stereo-EEG implantation strategy. *J Clin Neurophysiol*. 2016,33:483-489. https://pubmed.ncbi.nlm.nih.gov/27918343/. 2020. ● Skidmore CT. Adult focal epilepsies. *Continuum*. 2016,22:94-115. https://pubmed.ncbi.nlm.nih.gov/26844732/. 2020.

Medical Knowledge 2: Diagnostic Evaluation **Overall Intent:** To demonstrate understanding of the indications for, as well as risk and benefits of, invasive and non-invasive diagnostic testing in epilepsy	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of and indications for ordering routine tests and their costs*	● Recognizes appropriate times to order genetic and autoimmune testing for children and adults ● Understands when to order ambulatory versus inpatient video-EEG monitoring
Level 2 *Demonstrates knowledge of, risks, and benefits, and indications for ordering advanced diagnostic tests*	● Understands when patients should be recommended to undergo non-invasive presurgical testing ● Understands the role of PET, fMRI, and neuropsychological testing in pre-surgical evaluation ● Understands the appropriate setting in which anesthesia should be used to obtain these tests and the risks involved
Level 3 *Recognizes indications, implications, and limitations of less common testing (e.g., magnetoencephalography (MEG), ictal single photon emission computed tomography (SPECT), Wada)*	● Understands the role of MEG, quantitative image analysis, and intracranial EEG in the evaluation of non-lesional epilepsy ● Understands the specific clinical scenarios when Wada is indicated
Level 4 *Demonstrates knowledge of, risks and benefits, and indications for ordering invasive diagnostic tests*	● Understands the appropriate setting to recommend an intracranial study ● Understands when to recommend stereo EEGs versus subdural electrodes for intracranial evaluation
Level 5 *Participates in scholarly activity (e.g., publication in peer-reviewed literature) related to diagnostic investigation*	● Coauthors manuscript comparing diagnostic modalities in drug resistant epilepsy
Assessment Models or Tools	● Case conference ● Direct observation ● Medical record (chart) audit
Curriculum Mapping	●
Notes or Resources	● Bagic A, Funke ME, Kirsch HE, et al. The 10 common evidence-supported indications of MEG in epilepsy surgery: An illustrated compendium. *J Clin Neurophysiology*. 2020;37(6):483-497. https://europepmc.org/article/med/33165222. 2020. ● Jayakar P, Gaillard WD, Tripathi M, et al. Diagnostic test utilization in evaluation for resective epilepsy surgery in children. *Epilepsia*. 2014;55(4):507-518. https://pubmed.ncbi.nlm.nih.gov/24512473/. 2020. ● Ream MA, Pael AD. Obtaining genetic testing in pediatric epilepsy. *Epilepsia*. 2015;56(10):1505-1514. https://pubmed.ncbi.nlm.nih.gov/26345167/. 2020.

	● Shivon S, Guerrini R, Cook M, Lhatoo SD. *Epilepsy and Epileptic Seizures*. 1st ed. Oxford; Oxford University Press: 2013.

Medical Knowledge 3: Seizure and Epilepsy Classification **Overall Intent:** To demonstrate understanding of seizure and epilepsy classification and clinical and therapeutic implications	
Milestones	**Examples**
Level 1 *Demonstrates basic knowledge of common types of seizures and epilepsy, including epilepsy syndromes and epilepsy classification*	● Understands the basic differences between focal and generalized seizures ● Knows the clinical features of focal and generalized seizures ● Knows the differences between basic seizure semiology of temporal and extratemporal epilepsy
Level 2 *Demonstrates detailed knowledge of clinical and diagnostic findings in common epilepsy syndromes in children and adults*	● Knows clinical features and EEG findings of idiopathic and genetic epilepsies ● Knows typical and atypical presentations of common epilepsy syndromes
Level 3 *Demonstrates detailed knowledge of clinical and diagnostic findings in uncommon or rare epilepsy syndromes and epilepsies*	● Knows differences in semiology between mesial temporal and neocortical epilepsies ● Knows clinical, EEG and imaging findings of rare genetic, infantile encephalopathies and metabolic syndromes
Level 4 *Demonstrates advanced knowledge of epilepsies based on age, genetics, and other variables, and their potential impact on management*	● Knows the features of specific channelopathies ● Knows to avoid certain medications in autistic spectrum disorders and dietary therapies in metabolic disorders
Level 5 *Engages in scholarly activity related to clinical and diagnostic findings in seizures and epilepsy*	● Presents abstract at national meeting related to rare epilepsy syndrome
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Written examination
Curriculum Mapping	●
Notes or Resources	● Nocacher S, Peters A. Semiology of epileptic seizures: A critical review. Epilepsy and Behavior. 2012;15(1):2-9. https://pubmed.ncbi.nlm.nih.gov/19236941/. 2020. ● Scheffer et al. ILAE classification of epilepsies: Positions pater of the ILAE commission for classification and terminology. *Epilepsia*. 2017;58(4):512-521. https://pubmed.ncbi.nlm.nih.gov/28276062/. 2020. ● Wyllie E. *Treatment of Epilepsy: Principles and Practice*. 7th ed. Philadelphia, PA: Wolters Kluwer, 2021: 1064-1084.

Systems-Based Practice 1: Patient Safety **Overall Intent:** To engage in the analysis and management of patient safety events, including relevant communication with patients, families, and health care professionals	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of commonly reported patient safety events* *Demonstrates knowledge of how to report patient safety events*	● Has basic knowledge about the definition of patient safety events and reporting pathways ● Describes institutional seizure precautions
Level 2 *Identifies system factors that lead to patient safety events* *Reports patient safety events through institutional reporting systems*	● Identifies and reports a medication error caused by inadequate hand-off ● Describes efforts to reduce or eliminate falls in the epilepsy monitoring unit
Level 3 *Participates in analysis of patient safety events* *Participates in disclosure of patient safety events to patients and families*	● Participates in a root cause analysis for a medication error ● Attends a family meeting to disclose
Level 4 *Leads analysis of patient safety events and offers error prevention strategies* *Leads team disclosing patient safety events to patients and families*	● Collaborates in the analysis of a medication error to improve the hand-off process ● Discloses a medication error to patients/families
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*	● Engages appropriate stakeholders to improve awareness of seizure safety and first aid in the community ● Creates a staff education module around appropriate seizure precautions ● Leads a simulation for more junior residents in error disclosure
Assessment Models or Tools	● Direct observation ● Documentation of patient safety project ● E-module multiple choice tests ● Multisource feedback ● Portfolio ● Simulation
Curriculum Mapping	●

Notes or Resources	● Institute of Healthcare Improvement. http://www.ihi.org/Pages/default.aspx. 2020. ● Labiner DM, Bagic AI, Herman ST, et al. Essential services, personnel, and facilities in specialized epilepsy centers – Revised 2010 guidelines. *Epilepsia*. 2010;51(11):2322-2333. https://pubmed.ncbi.nlm.nih.gov/20561026/. 2020.

Systems-Based Practice 2: Quality Improvement (QI) **Overall Intent:** To conduct a QI project	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of basic quality improvement methodologies and metrics*	● Has basic knowledge about the definition of QI strategies
Level 2 *Describes local quality improvement initiatives (e.g., community vaccination rate, infection rate, smoking cessation)*	● Describes efforts to reduce or eliminate falls in the epilepsy monitoring unit
Level 3 *Participates in local quality improvement initiatives*	● Participates in a QI project, though may not have yet designed a QI project
Level 4 *Demonstrates the skills required to identify, develop, implement, and analyze a quality improvement project*	● Designs a QI project that will allow for urgent referrals to be seen in a timely fashion
Level 5 *Creates, implements, and assesses quality improvement initiatives at the institutional or community level*	● Analyzes and publishes the findings of a QI project to improve awareness of ● seizure symptoms within the community
Assessment Models or Tools	● Direct observation ● Documentation of a QI project ● E-module multiple choice tests ● Multisource feedback ● Portfolio ● Simulation
Curriculum Mapping	●
Notes or Resources	● Institute of Healthcare Improvement. http://www.ihi.org/Pages/default.aspx. 2020. ● Labiner DM, Bagic AI, Herman ST, et al. Essential services, personnel, and facilities in specialized epilepsy centers – Revised 2010 guidelines. *Epilepsia*. 2010;51(11):2322-2333. https://pubmed.ncbi.nlm.nih.gov/20561026/. 2020.

Systems-Based Practice 3: 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 the members of the interprofessional team
Performs safe and effective transitions of care/hand-offs in routine clinical situations	● Lists the essential components of an effective sign-out and care transition, including sharing information necessary for successful transitions
Demonstrates knowledge of population and community health needs and disparities	● Identifies components of social determinants of health and how they impact the delivery of patient care
Level 2 *Coordinates care of patients in routine clinical situations effectively using the roles of the interprofessional teams*	● Contacts social worker and pharmacist to get assistance for obtaining antiseizure medication begun in the hospital ● Understands the need for transition of care between the pediatric and adult epilepsy care teams
Performs safe and effective transitions of care/hand-offs in complex clinical situations	● Provides anticipatory guidance to night float team about a patient admitted for pre-surgical evaluation on reduced antiseizure medications with a history of status epilepticus
Identifies specific population and community health needs and inequities for their local population and community	● Identifies patients at risk for specific health outcomes related to health literacy concerns
Level 3 *Coordinates care of patients in complex clinical situations effectively using the roles of their interprofessional teams*	● Coordinates care of an epilepsy surgery patient with other health care professionals
Supervises transitions of care by other team members	● Supervises more junior residents when patients are transitioned from ICU
Effectively uses local resources to meet the needs of a patient population and community	● Works with local leaders to facilitate support group participation for patients
Level 4 *Role models effective coordination of patient-centered care among different disciplines and specialties*	● Leads the multidisciplinary epilepsy surgery conference

Role models safe and effective transitions of care/hand-offs within and across health care delivery systems including outpatient settings *Adapts practice to provide for the needs of specific populations*	● Leads a multidisciplinary discharge conference for the transition of a patient from the hospital to a long-term facility ● Works with program director to develop a multidisciplinary clinic for patients requiring epilepsy and comorbid psychiatric treatment
Level 5 *Improves quality of transitions of care within and across health care delivery systems to optimize patient outcomes* *Leads innovations in adapting practice and systems for populations and communities with health care disparities*	● Designs a transitional clinic from pediatric to adult care for patients with neurologic disorders ● Designs a curriculum on social determinants of health ● Develops a telehealth program for outlying clinics
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Multisource feedback ● Simulation
Curriculum Mapping	●
Notes or Resources	● Brown LW, Camfield PC, Capers M, et al. The neurologist's role in supporting transition to adult care: A consensus statement. *Neurology.* 2016;(87)3:835-840. https://pubmed.ncbi.nlm.nih.gov/27466477/. 2020. ● Centers for Disease Control and Prevention. Population Health Training. https://www.cdc.gov/pophealthtraining/whatis.html. 2020. ● 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. 2020.

Systems-Based Practice 4: Physician Role in Health Care Systems **Overall Intent:** To understand own role in the complex health care system and how to optimize the system to improve patient care and the health system's performance	
Milestones	**Examples**
Level 1 *Describes basic health care payment systems (e.g., government, private, public, uninsured care) and practice models*	● Recognizes the multiple, often competing, forces in the health care system
Identifies basic knowledge domains for effective transition to practice (e.g., information technology, legal, billing and coding, financial, personnel)	● Recognizes there are different payment systems, such as Medicare, Medicaid, Veterans Affairs (the VA), and commercial third-party payers ● Understands the impact of health plan features, including formularies ● Understands proper documentation is required for billing and coding
Level 2 *Delivers patient-centered care, considering patient's payment model*	● Identifies that late discharges impact bed availability
Demonstrates use of information technology required for medical practice (e.g., electronic health record, documentation required for billing and coding)	● Understands documentation to obtain approval for prior authorization ● Recognizes the impact on epilepsy care on uninsured or underinsured statuses ● Applies appropriate coding, with supervision, in compliance with regulations
Level 3 *Engages with patients in shared decision making, informed by each patient's payment models*	● Understands, accesses, and analyzes own performance data
Consistently demonstrates timely and accurate documentation, including coding and billing requirements	● Uses shared decision making and adapts choice of testing depending on the relevant clinical needs ● Completes notes for patient encounters within timeframe established by the institution
Level 4 *Uses available resources to promote optimal patient care (e.g., community resources, patient assistance resources) considering each patient's payment model*	● Collaborates with the institution to improve patient assistance resources
Implements changes in individual practice patterns in response to professional requirements and in preparation for practice	● Reviews patient's formulary and chooses an appropriate medication that will be covered by insurance or identifies programs to provide financial support for medication coverage ● Develops a post-residency plan for individual practice or additional education
Level 5 *Advocates for systems change that enhances high-value, efficient, and effective patient care*	● Participates in the development of an epilepsy clinic for uninsured or underinsured patients in the community

Educates others to prepare them for transition to practice	● Improves informed consent process for non-English-speaking patients requiring interpreter services ● Works with state medical association to advocate for access to neurologic care
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Multisource feedback
Curriculum Mapping	●
Notes or Resources	● Agency for Healthcare Research and Quality. Major Physician Measurement Sets. https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/physician/measurementsets.html. 2020. ● 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/. 2020. ● The Kaiser Family Foundation. www.kff.org. 2020.

Practice-Based Learning and Improvement 1: Evidence-Based and Informed Practice **Overall Intent:** To incorporate evidence from varied sources to optimize patient care, and to critically appraise the sources and analyze conflicting evidence	
Milestones	**Examples**
Level 1 *Demonstrates how to access and use available evidence, and to incorporate patient preferences and values in order to take care of a routine patient*	● Searches for appropriate evidence-based guidelines for a patient with new onset epilepsy
Level 2 *Articulates clinical questions and elicits patient preferences and values in order to guide evidence-based care*	● Asks about patient preferences for medical versus surgical treatment and searches literature for available options
Level 3 *Locates and applies the best available evidence, integrated with patient preference, to the care of complex patients*	● Applies evidence for alternate treatment options for a patient with treatment resistant epilepsy
Level 4 *Critically appraises and applies evidence, even in the face of uncertainty, and interprets conflicting evidence to guide care, tailored to the individual patient*	● Accesses the primary literature to address a unique clinical situation when the evidence is unclear or emerging ● Identifies new evidence that challenges current practice and appropriately applies
Level 5 *Coaches others to critically appraise and apply evidence for complex patients; and/or participates in the development of guidelines*	● Teaches an evidence-based medicine course
Assessment Models or Tools	● Direct observation ● Journal club assessment ● Multisource feedback ● Presentation
Curriculum Mapping	●
Notes or Resources	● U.S. National Library of Medicine. PubMed Tutorial. https://www.nlm.nih.gov/bsd/disted/pubmedtutorial/cover.html. 2020.

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; to reflect on all domains of practice, personal interactions, and behaviors, and their impact on colleagues and patients (reflective mindfulness); to 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*	● Creates personal learning goals
Identifies the factors that contribute to gap(s) between expectations and actual performance	● Identifies that too much time is spent on notes
Actively seeks opportunities to improve	● Asks attending for tips on efficient note writing
Level 2 *Demonstrates openness to performance data (feedback and other input)*	● Asks follow-up questions regarding how to improve after receiving feedback
Analyzes and reflects on the factors that contribute to gap(s) between expectations and actual performance	● Identifies that too much time spent on notes impacts other aspects of patient care
Designs and implements a learning plan, with prompting	● At the suggestion of the attending, creates a note template
Level 3 *Seeks performance data episodically, with adaptability and humility*	● Seeks feedback during and following rotations based upon own perceptions of personal performance
Analyzes, reflects on, and institutes behavioral change(s) to narrow the gap(s) between expectations and actual performance	● Tracks the time spent on notes to recognize improved efficiency
Independently creates and implements a learning plan	● Independently creates a note template to improve efficiency of documentation
Level 4 *Intentionally seeks performance data consistently with adaptability and humility*	● At the end of all rotations, seeks out and uses feedback on performance
Addresses assumptions and considers alternatives in narrowing the gap(s) between expectations and actual performance	● Works with information technology (IT) to improve note template after recognizing that documentation is still inefficient

Analyze and edit/modify learning plans regularly	● Gets quality monitoring reports from IT to review the learning plan
Level 5 *Role models consistently seeking performance data with adaptability and humility* *Coaches others on reflective practice* *Role models creation, implementation, analysis, and modification of learning plans*	● Asks more junior learners for feedback about the quality of educational experiences ● Encourages other learners on the team to consider how their behavior affects the rest of the team ● Implements “Feedback Fridays” with modification of learning plans following each session
Assessment Models or Tools	● Direct observation ● Multisource feedback ● Portfolio review ● Review of learning plan ● Semiannual review
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. 2020. ● 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_Correates_of_Physicians__Lifelong.21.aspx. 2020. ● 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. 2020.

Professionalism 1: Professional Behavior and Ethical Principles **Overall Intent:** To demonstrate ethical/professional behaviors and use resources to address ethical/professional conflicts	
Milestones	**Examples**
Level 1 *Identifies and describes potential triggers for professionalism lapses and how to report* *Demonstrates knowledge of ethical principles related to patient care*	● Understands that sleep deprivation can be a trigger for a lapse in professionalism ● Demonstrates knowledge of system to report breaches of professionalism in own institution ● Discusses the basic principles underlying ethics and professionalism and how they apply in various situations ● Understands institutional code of conduct
Level 2 *Demonstrates insight into professional behavior in routine situations and takes responsibility* *Analyzes straightforward situations using ethical principles*	● Acts professionally in daily interactions ● Acknowledges lapses without becoming defensive, making excuses, or blaming others ● Monitors and responds to fatigue, hunger, and stress in self and team members ● Applies ethical principles to straightforward informed consent
Level 3 *Demonstrates professional behavior in complex or stressful situations* *Analyzes complex situations using ethical principles*	● Navigates situations while under stress or when there are system barriers ● Applies ethical principles to end-of-life situations
Level 4 *Intervenes to prevent professionalism lapses in self and others* *Recognizes and uses appropriate resources for managing and resolving ethical dilemmas as needed*	● Assumes positive intent in evaluating others' perspective ● Seeks assistance for a colleague who is showing signs of physician impairment ● Requests ethics consult for patients who are unable to make their own decisions
Level 5 *Coaches others when their behavior fails to meet professional expectations* *Identifies and seeks to address system-level factors that induce or exacerbate ethical problems or impede their resolution*	● Serves as peer advisor about professional expectations and behavior ● Serves as the fellow member of the Institutional Review Board (IRB), Ethics, or Peer-Review Committee ● Identifies and works to resolve institutional policies that contribute to clinician stress
Assessment Models or Tools	● Case-based assessment ● Direct observation

	● Multisource feedback ● Simulation
Curriculum Mapping	●
Notes or Resources	● American Academy of Neurology (AAN). Code of Professional Conduct 2009. https://www.aan.com/globals/axon/assets/7708.pdf. 2020. ● American Medical Association. Ethics. https://www.ama-assn.org/delivering-care/ama-code-medical-ethics. 2020. ● Bernat JL. *Ethical Issues in Neurology*. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2008. ● 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. 2020. ● Levinson W, Ginsburg S, Hafferty FW, Lucey CR. *Understanding Medical Professionalism*. 1st ed. New York, NY: McGraw-Hill Education; 2014.

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 *Takes responsibility for failure to complete tasks and responsibilities, identifies potential contributing factors, and describes strategies for ensuring timely task completion in the future*	● Takes responsibility for consistently coming late to rounds and identifies sleep issues with newborn at home as contributing to tardiness ● When sleep deprived, sets multiple alarms
Responds promptly to requests or reminders to complete tasks and responsibilities	● Responds promptly to reminders from program administrator to complete work hour logs
Level 2 *Performs tasks and responsibilities in a timely manner with appropriate attention to detail in routine situations*	● Performs follow-up on results to outpatients ● Addresses inbox before leaving for vacation
Recognizes situations that may impact own ability to complete tasks and responsibilities in a timely manner	● Asks colleague to cover their inbox the week before board exams
Level 3 *Performs tasks and responsibilities in a timely manner with appropriate attention to detail in complex or stressful situations*	● Appropriately notifies fellow on day service about overnight call events during transition of care or hand-off ● Notifies attending of multiple competing demands on call, appropriately triages tasks, and asks for assistance from other fellows or faculty members, if needed
Proactively implements strategies to ensure that the needs of patients, teams, and systems are met	● When post call or on vacation, creates an away message
Level 4 *Recognizes situations in which own behavior may impact others' ability to complete tasks and responsibilities in a timely manner*	● Advises residents and more junior fellows how to manage their time in completing patient care tasks ● Communicates with program director if a problem requires a system-based approach and needs addressing at a higher administrative level ● Takes responsibility for potential adverse outcomes and professionally discusses with the interprofessional team
Level 5 *Develops or implements strategies to improve system-wide problems to improve ability for self and others to complete tasks and responsibilities in a timely fashion*	● Sets up a meeting with the nurse manager to streamline patient discharges ● Coaches more junior fellows to do a QI project to improve epilepsy monitoring unit safety

Assessment Models or Tools	● Compliance with deadlines and timelines ● Direct observation ● Multisource feedback ● Self-evaluations and reflective tools ● Simulation
Curriculum Mapping	●
Notes or Resources	● AMA. GME Competency Education Program: Modules on Professionalism. https://edhub.ama-assn.org/gcep. 2020. ● Bynny RL, Paauw DS, Papadakis MA, Pfeil S, Alpha Omega Alpha. *Medical Professionalism Best Practices: Professionalism in the Modern Era.* Menlo Park, CA: Alpha Omega Alpha Honor Medical Society; 2017. http://alphaomegaalpha.org/pdfs/Monograph2018.pdf. 2020. ● Code of conduct from fellow/resident institutional manual ● Expectations of fellowship program regarding accountability and professionalism ● Levinson W, Ginsburg S, Hafferty FW, Lucey CR. *Understanding Medical Professionalism*. New York, NY: McGraw-Hill Education; 2014. https://accessmedicine.mhmedical.com/book.aspx?bookID=1058. 2020.

Professionalism 3: Self-Awareness and 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 status of personal and professional well-being, with assistance* *Recognizes limits in knowledge/skills, with assistance*	● Accepts feedback and exhibits positive responses to constructive criticism or suggestions for change
Level 2 *Independently recognizes status of personal and professional well-being* *Independently recognizes limits in knowledge/skills*	● Recognizes one's own sleep deprivation ● Admits to the attending that they are not sure how to determine if an EEG shows focal slowing
Level 3 *With assistance, proposes a plan to promote personal and professional well-being* *With assistance, proposes a plan to remediate or improve limits in knowledge/skills*	● With guidance from the program director, makes room in daily schedule for personal time and hobbies ● With guidance from the program director, arranges for faculty members to review their approach for evaluating an EEG for focal slowing
Level 4 *Independently develops a plan to promote personal and professional well-being* *Independently develops a plan to remediate or improve limits in knowledge/skills*	● Arranges for team-building activities to help reduce stress ● Identifies EEG reporting guidelines for focal slowing and implements own strategy
Level 5 *Coaches others when emotional responses or limitations in knowledge/ skills do not meet professional expectations*	● Mentors colleagues in self-awareness and establishes plans to mitigate stress and burnout
Assessment Models or Tools	● Direct observation ● Group interview or discussions for team activities ● Individual interview ● Institutional online training modules ● Participation in institutional well-being programs ● Personal learning plan ● Self-assessment ● Self-reflection
Curriculum Mapping	●

Notes or Resources	● This subcompetency is not intended to evaluate a fellow's well-being, but to ensure each fellow 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. 2020. ● AAN. Residency Program Wellness. https://www.aan.com/tools-and-resources/academic-neurologists-researchers/program-and-fellowship-director-resources/residency-program-wellness/. 2020. ● Hicks PJ, Schumacher D, Guralnick S, Carraccio C, Burke AE. Domain of competence: personal and professional development. *Acad Pediatr*. 2014;14(2 Suppl):S80-97. https://www.academicpedsjnl.net/article/S1876-2859(13)00332-X/fulltext. 2020. ● Local resources, including Employee Assistance ● National Academy of Medicine. Action Collaborative on Clinical Well-Being and Resilience. https://nam.edu/initiatives/clinician-resilience-and-well-being/. 2020.

Interpersonal and Communication Skills 1: Patient- and Family-Centered Communication **Overall Intent:** To deliberately use language and behaviors to form constructive relationships with patients	
Milestones	**Examples**
Level 1 *Uses language and nonverbal behavior to demonstrate respect and establish rapport* *Identifies the need to individualize communication strategies based on patient/family expectations and understanding*	● Monitors and controls tone, non-verbal responses, and language to encourage dialogue ● Accurately communicates role in the health care system to patients/families ● Ensures communication is at the appropriate level for non-medical personnel ● Uses a culturally sensitive and inclusive approach to communication
Level 2 *Establishes a therapeutic relationship in straightforward encounters using active listening and clear language* *Communicates compassionately with patient/family to clarify expectations and verify understanding of the clinical situation*	● Restates patient perspective when discussing diagnosis and management ● Counsels patient with new onset epilepsy about driving restrictions ● Participates in a family meeting to discuss patient care goals
Level 3 *Establishes a therapeutic relationship in challenging patient encounters* *Communicates medical information in the context of patient/family values, uncertainty and conflict*	● Effectively counsels a patient regarding addiction potential of some antiseizure medications ● Organizes a family meeting to address caregiver expectations for an epilepsy patient to reassesses patient and family understanding and expectations of treatment and management of their epilepsy
Level 4 *Easily establishes therapeutic relationships, with attention to patient/family concerns and context, regardless of complexity* *Uses shared decision making to align patient/family values, goals, and preferences with treatment options*	● Continues to engage family members in goals of care discussions ● Engages family members in surgical decision making
Level 5 *Mentors others in situational awareness and critical self-reflection to consistently develop positive therapeutic relationships* *Role models shared decision making in the context of patient/family values, uncertainty and conflict*	● Leads debriefing after a difficult family meeting ● Leads teaching session on conflict resolution ● Maintains an appropriate therapeutic relationship with the family after an unexpected outcome

Assessment Models or Tools	● Direct observation ● Self-assessment including self-reflection exercises ● Structured case discussions
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. 2020. ● 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. 2020.

Interpersonal and Communication Skills 2: Barrier and Bias Mitigation **Overall Intent:** To recognize barriers and biases in communication and develop approaches to mitigate them	
Milestones	**Examples**
Level 1 *Identifies common barriers to effective patient care (e.g., language, disability)*	● Appropriately uses interpretation services ● Recognizes unconscious bias as a common barrier that can impact treatment decisions
Level 2 *Identifies complex barriers to effective patient care (e.g., health literacy, cultural)*	● Demonstrates respect for different cultural practices ● Provides alternate patient education materials for patients with low health literacy
Level 3 *Recognizes personal biases and mitigates barriers to optimize patient care, when prompted*	● Reflects on assumptions about a patient's sexuality or gender identity
Level 4 *Recognizes personal biases and proactively mitigates barriers to optimize patient care*	● Identifies how social determinants of health may impact compliance and health care utilization
Level 5 *Mentors others on recognition of bias and mitigation of barriers to optimize patient care*	● Models self-awareness and reflection around explicit and implicit biases ● Develops programs that mitigate barriers to patient education
Assessment Models or Tools	● Direct observation ● Self-assessment ● Structured case discussions
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. 2020. ● 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. 2020.

Interpersonal and Communication Skills 3: Patient and Family Education **Overall Intent:** To effectively educate patients and use shared decision making to improve outcomes	
Milestones	**Examples**
Level 1 *Recognizes link between patient outcomes and education* *Identifies the need to adjust communication strategies based on patient/family expectations and understanding of their health status and treatment options*	● Recognizes that the patient should understand the diagnosis of epilepsy and the importance of taking medication and adhering to treatment plan to prevent seizures ● Knows when to provide information to family members in their native language about seizures to better inform them about their child's epilepsy
Level 2 *Describes methods for effective patient education* *Organizes and initiates communication with patient/family by introducing stakeholders, setting the agenda, clarifying expectations, and verifying understanding of the clinical situation*	● Identifies online resources that are appropriate to the patient's condition ● Effectively uses a drawn diagram to explain focal seizures and their impact on the brain ● Coordinates additional teaching opportunities for families, such as a nursing teaching session about rescue medication for a patient with newly diagnosed epilepsy
Level 3 *Educates patients effectively in straightforward situations, including eliciting understanding of information provided* *Compassionately delivers medical information, elicits patient/family values, goals and preferences, and acknowledges uncertainty and conflict*	● Provides succinct, relevant, helpful, and understandable family education on rounds ● Compassionately conveys education in a conversational manner without lecturing, and regularly checks in (verbally or non-verbally) to confirm patient and families' understanding
Level 4 *Educates patients effectively in complex situations* *Independently uses shared decision making to align patient/family values, goals, and preferences with treatment options to make a personalized care plan*	● For a patient with Ohtahara Syndrome, educates the family about what is known and the limits of treatment ● In circumstances where information is not known by the fellow or epilepsy community, says "I don't know" when that is the case and follows up appropriately ● Educates patient and family about SUDEP in a supportive way ● Elicits family preferences and formulates an appropriate treatment plan taking these preferences into consideration

Level 5 *Educates patients in self-advocacy, community outreach, and activism* *Role models shared decision making in patient/family communication, including those with a high degree of uncertainty/conflict*	● Goes to local schools to educate students and staff members about epilepsy and seizure first aid ● Leads an interdisciplinary family meeting attended by more junior learners
Assessment Models or Tools	● Direct observation ● Multisource feedback ● Self-assessment ● Structured case discussions
Curriculum Mapping	●
Notes or Resources	● Jotterand F, Amodio A, Elger BS. Patient education as empowerment and self-rebiasing. *Med Health Care Philos*. 2016;19(4):553-561. https://link.springer.com/article/10.1007%2Fs11019-016-9702-9. 2020. ● Lindeman CA. Patient education. *Annu Rev Nur Res*. 1988;6:29-60. https://pubmed.ncbi.nlm.nih.gov/3291915/. 2020. ● Parent K, Jones K, Phillips L, Stojan JN, House JB. Teaching patient and family-centered care: Integrating shared humanity into medical education curricula. *AMA J Ethics*. 2016;18(1):24-32. https://journalofethics.ama-assn.org/sites/journalofethics.ama-assn.org/files/2018-06/medu1-1601.pdf. 2020.

Interpersonal and Communication Skills 4: Interprofessional and Team Communication **Overall Intent:** To effectively communicate with the health care team, including consultants, in both straightforward and complex situations	
Milestones	**Examples**
Level 1 *Respectfully requests and/or receives a consultation*	● Shows respect in health care team communications through words and actions
Uses language that values all members of the health care team	● Uses respectful communication to all staff members
Understands the importance of feedback	● Actively listens to and considers others' points of view in a nonjudgmental way
Level 2 *Clearly and concisely requests or responds to a consultation*	● Communicates specific recommendations to the referring provider following consultation
Communicates information effectively with all members of the health care team	● When transferring a patient to a different service, communicates change to all members of the team
Solicits feedback on performance as a member of the health care team	● Asks nurses for feedback after a rotation
Level 3 *Checks own or others understanding of consultation*	● Verifies understanding of own communications by restating critical values and unexpected diagnoses using closed loop communication
Uses active listening to adapt communication style to fit team needs	● Demonstrates active listening by fully focusing on all members of the team ● Recognizes nonverbal cues in a colleague and adjusts communication accordingly
Communicates concerns and provides feedback to peers and learners	● Respectfully and regularly provides feedback to more junior members of the medical team
Level 4 *Coordinates recommendations from different members of the health care team to optimize patient care*	● Incorporates recommendations from nurses to adjust medication schedule so as not to interfere with patient sleep schedule ● Assists in resolving conflicts between heath care team members
Communicates feedback and constructive criticism to superiors	● Informs medical team leaders of nursing concerns regarding patient management
Level 5 *Role models flexible communication strategies that value input from all health care team members, resolving conflict when needed*	● Is sought out by more junior learners for advice on how to resolve conflict within the health care team

Facilitates regular health care team-based feedback in complex situations	● Organizes a team meeting to discuss and resolve potentially conflicting points of view on a plan of care
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Multisource feedback ● Self-assessment ● Simulation
Curriculum Mapping	●
Notes or Resources	● Braddock CH III, 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://jamanetwork.com/journals/jama/fullarticle/192233. 2020. ● Dehon E, Simpson K, Fowler D, Jones A. Development of the faculty 360. *MedEdPORTAL*. 2015;11:10174. https://www.mededportal.org/publication/10174/. 2020. ● Fay D, Mazzone M, Douglas L, Ambuel B. A validated, behavior-based evaluation instrument for family medicine residents. *MedEdPORTAL*. 2007. https://www.mededportal.org/publication/622/. 2020. ● Green M, Parrott T, Cook G. Improving your communication skills. *BMJ*. 2012; 344:e357. https://www.bmj.com/content/344/bmj.e357. 2020. ● 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;35(5):395-403. https://www.tandfonline.com/doi/full/10.3109/0142159X.2013.769677. 2020. ● 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://www.ncbi.nlm.nih.gov/pubmed/10742358. 2020. ● Roth CG, Eldin KW, Padmanabhan V, Freidman EM. Twelve tips for the introduction of emotional intelligence in medical education. *Med Teach.* 2018:1-4. https://www.tandfonline.com/doi/full/10.1080/0142159X.2018.1481499. 2020.

Interpersonal and Communication Skills 5: Communication within Health Care Systems **Overall Intent:** To communicate effectively using a variety of methods	
Milestones	**Examples**
Level 1 *Accurately records information in the patient record as required by institutional policy* *Describes appropriate use of documentation shortcuts as required by institutional policy*	● Notes are accurate but may include extraneous information ● Identifies shortcuts in the electronic health record for clinic note writing
Level 2 *Demonstrates organized diagnostic and therapeutic reasoning through notes in the patient record* *Accurate, timely, and appropriate use of documentation shortcuts in formats specified by institutional policy*	● Creates organized and accurate notes ● Uses shortcuts and templates appropriately
Level 3 *Concisely reports diagnostic and therapeutic reasoning in the patient record* *Appropriately selects direct (e.g., telephone, in-person) and indirect (e.g., progress notes, text messages) forms of communication based on context*	● Documentation is accurate, organized, and concise, but may not consistently contain contingency planning for change in condition (i.e., anticipatory guidance) ● Knows when to direct concerns locally, departmentally, or institutionally, i.e., appropriate escalation ● Uses appropriate method when sharing results needing urgent attention
Level 4 *Communicates clearly, concisely, timely, and in an organized written form, including anticipatory guidance* *Achieves written or verbal communication (patient notes, email, etc.) that serves as an example for others to follow*	● Documentation is accurate, organized, and concise and includes anticipatory guidance ● Others turn to this fellow for examples of note template ● Notes are completed in a timely manner
Level 5 *Models feedback to improve others' written communication* *Guides departmental or institutional communication around policies and procedures*	● Teaches colleagues how to improve discharge instructions ● Leads a QI initiative to improve house staff hand-offs
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit

	● Multisource feedback ● Portfolio review
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. 2020. ● 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. 2020. ● 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. 2020.

To help programs transition to the new version of the Milestones, the original Milestones 1.0 have been mapped to the new Milestones 2.0; it is indicated if subcompetencies are similar between versions. These are not exact matches but include some of the same 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: History	PC1: History
PC2: Neurological Examination	PC2: Neurologic Examination
PC3: Medical Management	PC3: Medical Management
PC4: Surgical Management	PC4: Surgical Management
PC5: Emergent and Critical Care Management	PC5: Emergent and Critical Care PC7: Read and Interpret Electroencephalogram (EEG)
PC6: Cognitive, Behavioral, and Psychiatric Disorders Associated with Seizure Disorders	PC6: Cognitive, Behavioral, and Psychiatric Disorder Associated with Seizure Disorders
MK1: Epilepsy Localization	MK1: Epilepsy Localization PC7: Read and Interpret Electroencephalogram (EEG)
MK2: Diagnostic Investigation	MK2: Diagnostic Investigation
MK3: Seizure and Epilepsy Classification	MK3: Seizure and Epilepsy Classification
SBP1: Work in Interprofessional Teams to Enhance Patient Safety	SBP1: Patient Safety
SBP2: Systems Thinking, including Cost- and Risk-Effective Practice	SBP2: Quality Improvement SBP4: Physician Role in Health Care Systems
SBP3: Advocacy, Continuum of Care, and Community Resources	SBP3: System Navigation for Patient-Centered Care
PBLI1: Self-directed learning	PBLI2: Reflective Practice and Commitment to Personal Growth
PBLI2: Locate, Appraise, and Assimilate Evidence from Scientific Studies Related to Patient's Health Problems	PBLI1: Evidence-Based and Informed Practice
PROF1: Compassion, Integrity, Accountability, and Respect for Self and Others	PROF2: Accountability/Conscientiousness PROF3: Self-Awareness and Well-Being
PROF2: Knowledge about, Respect for, and Adherence to the Ethical Principles Relevant to the Practice of Medicine, remember in particular that responsiveness to patients that supersedes self-interest is an essential aspect of medical practice	PROF1: Professional Behavior and Ethical Principles

ICS1: Relationship Development, Teamwork, and Managing Conflict	ICS1: Patient- and Family-Centered Communication ICS3: Patient and Family Education ICS4: Interprofessional and Team Communication
ICS2: Information Sharing, Gathering, and Technology	ICS5: Communication within the Health Care Systems
	ICS2: Barrier and Bias Mitigation

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/