Supplemental Guide:
Neurodevelopmental Disabilities
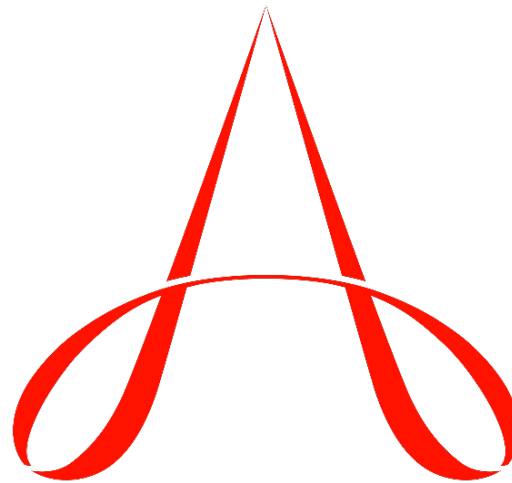
ACGME

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Milestones Supplemental Guide

This document provides additional guidance and examples for the Neurodevelopmental Disabilities 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: Neurologic and Developmental History
Overall Intent: To efficiently obtain, communicate, and document a history that addresses the neurologic and/or developmental question

Milestones	Examples
Level 1 *Obtains, communicates, and documents an appropriate history and begins to document perinatal, developmental, and family components*	● In a child being evaluated for global developmental delay, not taking a three-generation pedigree ● In obtaining developmental history, including functional abilities that are not typically achieved at the child's age or not able to be quantified ● Failure to elicit history of chronic illness in the mother that precedes pregnancy
Level 2 *Obtains, communicates, and documents a relevant history, including perinatal, developmental, and family components, eliciting patient's and patient's family's contributions based on cognitive level and cultural norms*	● Maternal uncle is in special education and maternal grandfather has a new onset movement disorder ● Collects external therapy notes and school data to incorporate into the report ● The clinic note is generally organized, but the attending still needs to add some clarification
Level 3 *Obtains, communicates, and documents a well-organized history that incorporates supplemental data from external sources*	● Obtains a history that a faculty member can follow during the presentation; does not skip around in the history ● Writes complete, organized, and clear clinic notes; does not need the attending to edit them
Level 4 *Reconciles information from conflicting sources or sources that are difficult to access into the history, and uses the history to develop a differential diagnosis that serves as a foundation for an etiological evaluation*	● Interprets, weighs, and synthesizes historical information to develop differential diagnoses ● Uses alternative techniques to elicit history from family and health team members who cannot be present for the evaluation ● Recognizes and applies historical clues to comorbid conditions
Level 5 *Teaches the fine points of history-taking to other learners*	● Demonstrates taking a history to medical students ● Provides documentation that can educate referring providers or family
Assessment Models or Tools	● American Board of Psychiatry and Neurology (ABPN) clinical skills exam (NEX) ● Direct observation ● Medical record (chart) audit ● Objective structured clinical exams (OSCE)s
Curriculum Mapping	●
Notes or Resources	● Accardo PJ. *Capute & Accardo's Neurodevelopmental Disabilities in Infancy and Childhood*. 3rd ed. Baltimore, MD: Brookes; 2008. ISBN: 978-1557667564. ● Swaiman KF, Ashwal S, Ferriero DM, Schor N. *Swaiman's Pediatric Neurology*. 6th ed. Philadelphia, PA: Elsevier; 2017. ISBN:978-0323371018.

Neurodevelopmental Disabilities Supplemental Guide

Patient Care 2: Neurodevelopmental Examination	
Overall Intent: To efficiently obtain, communicate, and document a developmentally appropriate physical examination that addresses the neurologic question	

Milestones	Examples
Level 1 *Identifies components of and performs a complete neurodevelopmental examination (neurological and developmental components)*	● For an infant with global developmental delays, measures the head size, assesses visual attention and interactions, and checks muscle tone and reflexes, making some errors in assessment of strength ● In a child with concerns for congenital infection, unable to visualize the fundus ● In a child with a posterior fossa tumor, performs maneuvers to assess for ataxia and cranial nerve dysfunction, but is unable to visualize the optic discs ● In a child who is being evaluated for possible neurofibromatosis, neglects to evaluate for axillary and inguinal freckling
Level 2 *Performs, communicates, and documents an accurate neurodevelopmental examination on patients across the lifespan*	● Performs a systematic neurologic history including mental status, cranial nerves including fundoscopic, motor, sensory, coordination, and gait examinations, all of which are reproducible by faculty members
Level 3 *Performs, communicates, and documents a comprehensive and relevant neurodevelopmental examination, incorporating some additional pertinent maneuvers on patients ranging across the lifespan*	● In evaluating children with hemiplegic cerebral palsy, evaluates for homonymous hemianopia and cortical sensory dysfunction ● Detects and differentiates dysmorphisms that define syndromes associated with intellectual disability
Level 4 *Consistently demonstrates mastery in performing, communicating, and documenting a neurodevelopmental examination on patients ranging across the lifespan to inform diagnostic and treatment recommendations*	● For a 19-year-old patient with Down syndrome who acutely stops walking, quickly performs and communicates an accurate focused examination of critical areas to include power examination, reflexes, and sensory level ● For a girl with acute spinal cord symptoms, quickly performs and communicates an accurate focused examination of critical areas to include power examination, sensory level, and reflexes
Level 5 *Teaches other learners of varying experience and disciplines about techniques of the neurodevelopmental examination and implications of findings across a broad range of disorders*	● After evaluating an adolescent male with autism spectrum disorder for altered mental status in the emergency department, identifies features of catatonia
Assessment Models or Tools	● ABPN NEX ● Direct observation ● Medical record (chart) audit ● OSCEs ● Simulation
Curriculum Mapping	●

Notes or Resources	● DeMyer WE. *Technique of the Neurological Examination*. 5th ed. New York; NY: McGraw Hill; 2004. ISBN:978-0071405683.
	● Larsen PD, Stensaas SS. PediNeurologic Exam: A Neurodevelopmental Approach. https://neurologicexam.med.utah.edu/pediatric/html/home_exam.html. 2021.
	● O'Brien M. *Aids to the Examination of the Peripheral Nervous System*. 5th ed. Philadelphia, PA: Elsevier; 2010. ISBN:978-0702034473
	● Volpe JJ. *Neurology of the Newborn*. 6th ed. Philadelphia, PA: Elsevier; 2017. ISBN:978-0323428767.
	   o Du Plessis AJ, Volpe JJ. Congenital hydrocephalus. In: Volpe JJ. *Neurology of the Newborn*. 6th ed. Philadelphia, PA: Elsevier; 2017:58.
	   o Du Plessis AJ, Limperopoulos C, Volpe JJ. Cerebellar development. In: Volpe JJ. *Neurology of the Newborn*. 6th ed. Philadelphia, PA: Elsevier; 2017:73.
	   o Volpe JJ. Neurological examination: Normal and abnormal features. In: Volpe JJ. *Neurology of the Newborn*. 6th ed. Philadelphia, PA: Elsevier; 2017:191.

Patient Care 3: Neurodevelopmental Disabilities	
Overall Intent: To demonstrate a comprehensive understanding of neurodevelopmental disability diagnoses	

Milestones	Examples
Level 1 *Recognizes when a patient may have a neurodevelopmental disability*	● Identifies signs of motor asymmetry ● Recognizes atypical patterns of eye contact and social reciprocity ● Identifies significant delays in milestone acquisition (such as a nonverbal three-year-old)
Level 2 *Identifies neurodevelopmental disabilities' phenomenology and diagnoses*	● Identifies hemiparesis in a child with history of prematurity and intraventricular hemorrhage ● Elicits specific findings during history gathering to assess a possible diagnosis of an autism spectrum disorder ● Recognizes typical phenotypic features of common genetic causes of intellectual disability (e.g., Down syndrome, Fragile X syndrome, Williams syndrome, etc.)
Level 3 *Diagnoses common neurodevelopmental disabilities and coexisting disorders*	● Elicits history of clinical features of attention deficit hyperactivity disorder (ADHD) in a patient with a diagnosis of a tic disorder ● Screens for comorbid attention or learning difficulties in a child with benign rolandic epilepsy or neurofibromatosis ● Makes a diagnosis of autism in a patient with tuberous sclerosis
Level 4 *Distinguishes uncommon neurodevelopmental disabilities from alternative conditions that may have a similar presentation*	● Differentiates a diagnosis of hereditary spastic paraplegia from tethered cord ● Orders overnight electroencephalogram (EEG), which reveals electrical status epilepticus in sleep as the cause of a child's language regression ● Pursues metabolic and genetic testing in a child with cerebral palsy but normal brain magnetic resonance imaging (MRI)
Level 5 *Identifies previously undescribed neurodevelopmental disability disorders or engages in scholarly activity (e.g., teaching, research) in neurodevelopmental disabilities*	● Adapts common tools for telemedicine usage ● Develops evaluation protocols for children with sensory or communication needs that are not addressed with standard instruments
Assessment Models or Tools	● Direct observation
Curriculum Mapping	●
Notes or Resources	● Ashwal S, Russman BS, Blasco PA, et al. Practice parameter: Diagnostic assessment of the child with cerebral palsy: report of the Quality Standards Subcommittee of the American Academy of Neurology and the Practice Committee of the Child Neurology Society. *Neurology*. 2004;62(6):851-863. https://n.neurology.org/content/62/6/851.long. 2021. ● Filipek PA, Accardo PJ, Ashwal S, et al. Practice parameter: Screening and diagnosis of autism. *Neurology*. 2000;55(4):468-479. https://n.neurology.org/content/55/4/468.long. 2021.

Patient Care 4: Behavioral and Psychiatric Disorders
Overall Intent: To recognize, evaluate, diagnose, and manage patients with cognitive, behavioral, or psychiatric disorders

Milestones	Examples
Level 1 *Recognizes when a patient with a neurodevelopmental disorder has a behavioral or psychiatric disorder* *Lists various treatment approaches to behavioral or psychiatric disorders in patients with neurodevelopmental disorders*	● Detects changes in school performance, appetite, sleep, recreation, socialization ● Parent-child interaction therapy, cognitive behavioral therapy, applied behavior analysis, pharmacological interventions including SSRIs
Level 2 *Identifies common behavioral or psychiatric disorders in patients with neurodevelopmental disorders* *Identifies major side effects of psychiatric and neurotropic medications in patients with neurodevelopmental disorders*	● Generalized anxiety disorder, obsessive-compulsive disorder, major depressive disorder, post-traumatic stress disorder ● Serotonin syndrome, tardive dyskinesia, metabolic syndrome, selective serotonin reuptake inhibitors (SSRIs), and "black box" warning
Level 3 *Diagnoses common behavioral or psychiatric disorders in patients with neurodevelopmental disorders* *Manages patients with common psychiatric disorders in patients with neurodevelopmental disorders*	● Screens for comorbid anxiety and mood disorders in ADHD ● Manages patients with obsessive-compulsive disorder and Tourette syndrome
Level 4 *Diagnoses uncommon cognitive and behavioral disorders in patients with neurodevelopmental disorders* *Manages complex combinations of medications with central nervous system effects in patients with neurodevelopmental disorders*	● Recognizes when a patient's neurological symptoms are of psychiatric origin ● Recognizes when a patient's psychiatric symptoms are of neurologic origin ● Manages patients with comorbid anxiety and mood disorders in ADHD ● Manages patients with catatonia and Down syndrome
Level 5 *Engages in scholarly activity (e.g., teaching, research) in cognitive, behavioral, or psychiatric disorders*	● Reviews the literature and prepares a seminar on the mechanisms of self-injury in intellectual disability

Demonstrates sophisticated knowledge of advanced diagnostic testing related to behavioral or psychiatric disorders in patients with neurodevelopmental disorders	● Teaches other residents how to interpret neuropsychology testing and implications for school management
Assessment Models or Tools	● Direct observation
Curriculum Mapping	●
Notes or Resources	● American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Washington, DC: American Psychiatric Association; 2013. https://dsm.psychiatryonline.org/doi/book/10.1176/appi.books.9780890425596. 2021. ● Hauptman AJ, Salpekar JA. *Pediatric Neuropsychiatry: A Case-Based Approach.* 1st ed. Cham: Springer International Publishing; 2018. ISBN:978-3319949970.

Patient Care 5: Critical Care	
Overall Intent: To diagnose and manage critical illnesses and emergencies that affect the nervous system	

Milestones	Examples
Level 1 *Recognizes critical illnesses and emergencies that affect the nervous system*	● Recognizes that sudden onset weakness of the right arm may be a stroke ● Recognizes the need for immediate treatment of status epilepticus
Level 2 *Diagnoses critical illnesses and emergencies that affect the nervous system*	● Diagnoses hypoxic ischemic encephalopathy in a newborn and initiates therapeutic cooling protocol ● Diagnoses shunt failure in a child with hydrocephalus and arranges for imaging and neurosurgical consultations. Diagnoses Guillain Barre syndrome in an adolescent female who presents with progressive gait abnormality which was thought to be functional in nature
Level 3 *With direct supervision, manages critical illnesses and emergencies that affect the nervous system*	● Uses an appropriate protocol of drugs and EEG monitoring for the treatment of a patient diagnosed with refractory status epilepticus under the direct supervision of a faculty member
Level 4 *With indirect supervision, diagnoses and manages critical illnesses and emergencies that affect the nervous system*	● Independently identifies signs and symptoms of increased intracranial pressure, orders emergent head neuroimaging, and initiates treatment ● Independently diagnoses acute stroke and initiates pediatric brain attack protocol ● Independently recognizes shifting level of consciousness in an 18-year-old patient with intellectual disability and arranges for transfer to a facility with a higher level of acuity
Level 5 *Teaches and supervises others in the management of critical illnesses and emergencies that affect the nervous system, and is an integral part of the interdisciplinary team*	● Is sought out by intensive care unit (ICU) faculty members for insight into clinical situations and management
Assessment Models or Tools	● ABPN NEX ● Direct observation ● Medical record (chart) audit ● OSCEs ● Simulation
Curriculum Mapping	●
Notes or Resources	● Suarez JI. Neurocritical care. *Continuum*. 2018;24(6). https://journals.lww.com/continuum/pages/toc.aspx?year=2018&issue=12000&currenttab=IssueOverview. 2021. ● Swaiman KF, Ashwal S, Ferriero DM, Schor N. *Swaiman's Pediatric Neurology*. 6th ed. Philadelphia, PA: Elsevier; 2017. ISBN:978-0323371018.

Patient Care 6: Diagnosis and Management of the Inpatient Setting	
Overall Intent: To gain competence in diagnosing and managing patients with neurological symptoms and disorders in the inpatient setting	

Milestones	Examples
Level 1 *Identifies typical presentations of common neurodevelopmental conditions (neurological and developmental components)* *Develops an initial plan to diagnose common neurodevelopmental disorders (neurological and developmental components)*	● Identifies an eight-year-old boy with right-sided shaking as a possible seizure ● Orders EEG for patient with possible focal seizure and considers neuroimaging
Level 2 *Diagnoses common neurodevelopmental conditions* *Manages common neurodevelopmental disorders, considering risks and benefits of treatment*	● Evaluates a toddler with altered mental status and considers encephalitis ● Evaluates a patient for feeding disorders ● Considers neuroimaging before lumbar puncture ● Recommends a patient undergo a lumbar puncture to evaluate cerebrospinal fluid autoimmune and infectious studies
Level 3 *Identifies atypical presentations of common neurodevelopmental conditions and typical presentations of uncommon neurodevelopmental conditions* *Individualizes management, ensuring the appropriate level of care throughout hospitalization and upon discharge*	● Evaluates a child coming from another country for pre-transplant evaluation who has seizures and identifies an underlying neurocutaneous disorder through use of a Wood's lamp ● Cares for a nine-year-old boy with autism and significant behavioral challenges who is admitted for a new onset of epilepsy; and given the patient's risk for future seizures, appropriately recommends a daily anti-convulsant avoiding levetiracetam due to concern for worsening behavior
Level 4 *Diagnoses uncommon neurodevelopmental conditions*	● Evaluates a three-year-old patient with developmental regression, worsening vision, myoclonic, and atonic seizures admitted for myoclonic status epilepticus; orders confirmatory testing to confirm the diagnosis after an EEG shows a time-locked photoparoxysmal response at low-frequency flash stimulation on EEG and suspects neuronal ceroid lipofuscinosis ● Evaluates an 11-year-old patient with a history of cerebral palsy, presenting with apparent neuroleptic malignant syndrome, and on review of old video tape finds a slowly progressive disorder that is of mitochondrial origin

Reviews and evaluates the literature to manage treatment responses, disease progression, and complications of therapy	● Diagnoses a patient with electrographic status epilepticus of sleep with clinical developmental and language regression after obtaining an overnight EEG and starts the child on therapy with high dose bedtime diazepam; makes an appropriate recommendation on when to order another EEG to confirm response and knows how to change management if electrographic status epilepticus of sleep is still present on EEG
Level 5 *Teaches inpatient management of neurodevelopmental conditions to other learners* *Conducts scholarly reviews, original research or participates in the development of clinical guidelines*	● Lectures more junior residents on the comorbidities and management and prognosis of acquired and traumatic brain injury ● Leads the inpatient interdisciplinary team in making complex management decisions, appropriately using ancillary services, and appropriately ordering neurodiagnostic testing and treatments for a variety of neurodevelopmental conditions in the hospital
Assessment Models or Tools	● ABPN NEX ● Direct observation ● Mock oral examination of clinical reasoning ● OSCEs
Curriculum Mapping	●
Notes or Resources	● American Academy of Neurology. Clinical guidelines. https://www.aan.com/policy-and-guidelines/guidelines/. 2021. ● Institutional protocols

Patient Care 7: Diagnosis and Management in the Outpatient Setting	
Overall Intent: To diagnose and manage patients with neurological symptoms and disorders in the outpatient setting	
Milestones	**Examples**
Level 1 *Identifies typical presentations of common neurodevelopmental conditions*	● Lists the typical features of migraine headaches ● Lists reasons why a spell may or may not be a seizure ● Identifies signs of motor or tone asymmetry ● Recognizes when developmental delay is present ● Recognizes classic features of autism (e.g., poor eye contact, stereotypies, echolalia)
Develops an initial plan to diagnose common neurodevelopmental disorders	● Recommends initial diagnostic testing to assess for causes of developmental delays ● Recommends good headache hygiene and appropriate doses of over-the-counter pain medications for a patient with migraines ● Suggests an appropriate plan for a child seen after first unprovoked seizure(s)
Recognizes the value and need for monitoring in the provision of ongoing care	● Considers referral for appropriate therapy services and family supports for patients with neurodevelopmental disorders ● Recommends short-interval follow-up for diagnosis of migraine headaches ● Recommends appropriate intervals of developmental monitoring to assess for progress and response to interventions
Level 2 *Diagnoses common neurodevelopmental conditions*	● Diagnoses ADHD ● Diagnoses migraine headaches in a patient with the typical features after obtaining the important historical components ● Diagnoses childhood absence syndrome instead of generic "epilepsy" ● Diagnoses cerebral palsy in a patient with non-progressive hemiparesis ● Diagnoses a patient with an autism spectrum disorder
Manages common neurodevelopmental disorders, considering risks and benefits of treatment	● Manages ADHD by following American Academy of Pediatrics (AAP) guidelines ● Recommends triptans for a migraine headache that does not respond to over-the-counter medication, and counsels family ● Recommends an appropriate second anti-seizure medication if a patient has side effects after the first
Enumerates the areas that are to be monitored for children with complex care needs	● Discusses the potential behavioral consequences of starting levetiracetam for seizures in a child with aggressive behavior ● Refers patients with cerebral palsy for orthopedic and ophthalmologic monitoring ● Refers patients with cerebral palsy for feeding and swallowing evaluations

Level 3 *Recognizes atypical variants of common neurodevelopmental conditions and typical presentations of uncommon neurodevelopmental conditions*	● Diagnoses infantile spasms outside of a classic presentation ● Recognizes intellectual disability in a child who presents with motor delay
Assesses the effectiveness of management programs, and individualizes management and adapts plan based on patient response and family factors	● Uses specific features of genetic testing or EEG features in children with epilepsy to guide consideration of preventive seizure medication; avoids prescribing valproate when families would like to avoid blood testing ● Avoids beta blockers for the treatment of essential tremor for patients with asthma
Uses longitudinal follow-up and re-evaluations to assess effectiveness of care	● Monitors progression of muscle tone and spasticity in a patient with cerebral palsy ● Identifies patients at risk of academic difficulties without appropriate school-based supports
Level 4 *Diagnoses uncommon neurodevelopmental conditions*	● Appropriately diagnoses Joubert syndrome ● Recognizes brittle or coarse hair as a potential sign of Menkes disease
Manages disease progression and complications of therapy; identifies when to change acuity of care considering lifespan issues	● Correctly refers a patient to the emergency room when a patient with history of migraines presents to clinic with acute, worsening encephalopathy and focal neurological deficits ● Correctly obtains urgent prolonged EEG in an infant with tuberous sclerosis with new events concerning for infantile spasms
Uses new information from the literature to provide anticipatory guidance appropriate to the patient's developmental age	● Discusses the relative advantages of limited powers of attorney over guardianship
Level 5 *Teaches other learners about the presentation, evaluation, diagnosis, and management of neurodevelopmental conditions*	● Lectures residents on Supplemental Security Income (SSI) determination criteria
Coordinates, supervises, and evaluates quality of care	● Longitudinally follows a patient with epilepsy; determines how often a patient with complex epilepsy needs to be seen in clinic, knows when to change medications and when to make a diagnosis of intractable epilepsy, and orders an appropriate pre-surgical evaluation for intractable epilepsy
Teaches other learners about longitudinal and complex needs	● Lectures multidisciplinary professionals on transition issues related to pediatric to adult care in patients with neurodevelopmental disabilities
Assessment Models or Tools	● ABPN NEX ● Direct observation

	● Mock oral examination ● OSCEs
Curriculum Mapping	●
Notes or Resources	● American Academy of Neurology. Clinical guidelines. https://www.aan.com/policy-and-guidelines/guidelines/. 2021. ● Institutional protocols and pathways ● Wolraich ML, Hagan JF Jr, Allan C, et al. Clinical practice guideline for the diagnosis, evaluation, and treatment of attention – deficit/hyperactivity disorder in children and adolescents. *Pediatrics*. 2019;144(4):e20192528. https://pediatrics.aappublications.org/content/144/4/e20192528.long. 2021.

Patient Care 8: Electroencephalogram (EEG)	
Overall Intent: To interpret and create reports for common EEG abnormalities	

Milestones	Examples
Level 1 *Describes general indications and test selection for electroencephalographic studies*	● Discusses that a suspected seizure and change in level of consciousness are indications for an EEG
Level 2 *Describes normal EEG features and identifies status epilepticus using correct terminology, including common artifacts, across the lifespan*	● Describes the posterior dominant rhythm and sleep/wake states ● Describes eye blink artifact ● Uses terminology including montage, amplitude, frequency, spikes, etc. ● Identifies abnormal, rhythmic electrographic patterns indicative of status epilepticus
Level 3 *With direct supervision, recognizes and describes patterns of status epilepticus, normal EEG variants, and common abnormalities across the lifespan, and writes a report*	● Discusses that continuous right central spikes may be focal status epilepticus ● Correctly identifies Rolandic spikes may be associated with self-limited epilepsy with centrotemporal spikes ● Describes spikes over the right temporal area ● Describes positive occipital sharp transients of sleep ● Correctly identifies generalized 3-Hz spike-wave activity provoked by hyperventilation as an absence seizure ● Identifies and describes hypsarrhythmia ● Utilizes video review to differentiate rhythmic EEG artifact (such as patting or respiratory therapy) from electrographic seizure activity
Level 4 *With indirect supervision, reads a standard EEG and writes a report*	● Produces a systematic description of the EEG record with reasonable interpretation of the significance of common findings
Level 5 *Interprets uncommon EEG abnormalities or conducts research using EEG*	● Correctly identifies eye closure sensitivity ● Assesses interburst interval in context of gestational age
Assessment Models or Tools	● Assessment during case conferences ● Direct observation ● Mock oral examination
Curriculum Mapping	●
Notes or Resources	● There are several venues in which the reliability of the resident interpretation of EEG can be assessed. These would include escalation protocol rotations, neonatal intensive care unit rotations, epilepsy monitoring unit rotations and, although not usually applicable to outpatient records, the ability to interpret the EEG report in the clinical setting is frequently done in that setting ● Britton JW, Frey LC, Hopp JL. *Electroencephalography (EEG): An Introductory Text and Atlas of Normal and Abnormal Findings in Adults, Children, and Infants [Internet].* Chicago, IL: American Epilepsy Society; 2016. https://www.ncbi.nlm.nih.gov/books/NBK390356/. 2021.

	● Fisch B. *Fisch and Spehlmann's EEG Primer: Basic Principles of Digital and Analog* EEG. 3rd ed. Philadelphia, PA: Elsevier; 1999. ISBN:978-0444821485. ● Libenson MK. *Practical Approach to Electroencephalography*. Philadelphia, PA: Elsevier Health Sciences; 2010. ISBN:978-0750674782. ● Schomer DL, Lopes da Silva F. *Niedermeyer's Electroencephalography: Basic Principles, Clinical Applications, and Related Fields*. 6th ed. Philadelphia. PA: Lippincott, Williams, & Wolters; 2011. ISBN:978-0781789424.

Patient Care 9: Lumbar Puncture	
Overall Intent: To independently perform lumbar puncture in the appropriate settings	

Milestones	Examples
Level 1 *Lists the indications, contraindications, and complications of lumbar puncture*	● Indications for a lumbar puncture include for a patient with fever and altered mental status ● Contraindications include bleeding risk, suspicion of space-occupying lesion causing mass effect, etc. ● Identifies complications of lumbar puncture include headache, infection, and epidural hematoma
Level 2 *With direct supervision, chooses cerebrospinal fluid studies based on clinical presentation, performs lumbar puncture, manages complications, and interprets findings*	● Orders glucose, protein, cell count, culture, viral studies in a patient presenting with meningitis ● Obtains opening pressure for patients with suspected idiopathic intracranial hypertension ● Performs lumbar puncture using appropriate technique with faculty member at bedside ● Manages post-lumbar puncture headache and back pain appropriately ● Consults anesthesia for blood patch when appropriate
Level 3 *With indirect supervision, performs lumbar puncture and interprets findings*	● Performs lumbar puncture using appropriate technique with faculty member(s) available as needed ● Differentiates between bacterial, viral, aseptic, and fungal meningitis based on pattern of glucose, protein, and cell count
Level 4 *Identifies and interprets specialized cerebrospinal fluid studies to aid diagnosis, and independently performs lumbar puncture on patients across the lifespan*	● Obtains cerebrospinal fluid lactate for suspected metabolic disorders ● Obtains serum glucose and compares to cerebrospinal fluid studies in patients suspected of having glucose transporter deficiencies ● Identifies albuminocytologic dissociation as an indicator of inflammatory processes ● Performs lumbar puncture using appropriate technique on patients of all ages, including neonates, without direct supervision of faculty members
Level 5 *Instructs others in proper lumbar puncture technique and administers intrathecal therapies*	● Teaches more junior learners appropriate positioning and procedures for performing lumbar punctures ● Assists other learners, providers, and staff members in obtaining cerebrospinal fluid in the setting of difficult or complex patient anatomy ● Administers intrathecal medication such as baclofen
Assessment Models or Tools	● Direct observation ● Review of laboratory results ● Simulation
Curriculum Mapping	●
Notes or Resources	● Ellengy MS, Tegtmeyer K, Lai S, Braner DAV. Lumbar puncture. *N Engl J Med* 2006;355:e12. https://www.nejm.org/doi/full/10.1056/NEJMvcm054952. 2021.

	● Du Plessis AJ, Limperopoulos C, Volpe JJ. Cerebellar development. In: Volpe JJ. *Neurology of the Newborn*. 6th ed. Philadelphia, PA: Elsevier; 2017:73.

Patient Care 10: Determination of Death by Neurologic Criteria	
Overall Intent: To make an appropriate determination of death using neurologic criteria	

Milestones	Examples
Level 1 *Discusses the concept of determination of death by neurologic criteria*	● Explains why death may be declared while heart and lungs work or are being supported; may discuss criteria in general, but not identify all criteria
Level 2 *Identifies components of determination of death by neurologic criteria*	● Cites the different criteria for determination of death by neurologic criteria at different ages
Level 3 *With assistance, performs determination of death by neurologic criteria*	● Performs the exam with assistance, with the observer helping with technique or helping identify other components of the exam not addressed by the resident
Level 4 *Performs determination of death by neurologic criteria in compliance with practice guidelines and state regulations*	● Performs the exam, including a complete and accurate assessment with faculty member present but not participating (simulation or live)
Level 5 *Teaches others the determination of death by neurologic criteria*	● Models the approach to determination of death by neurologic criteria, including identifying the patient appropriately, discussing with the patient's family, discussing with other medical teams and staff members, completing a full exam accurately, interpreting the exam appropriately, and discussing the results and interpretation with the family professionally and compassionately
Assessment Models or Tools	● Direct observation ● Simulation
Curriculum Mapping	●
Notes or Resources	● Martin SD, Porter MB. Performing the brain death examination and the declaration of pediatric brain death. *J Pediatr Intensive Care*. 2017;6(4):229-233. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6260313/pdf/10-1055-s-0037-1604013.pdf. 2021. ● Nakagawa TA, Ashwal S, Mathur M, et al. Guidelines for the determination of brain death in infants and children: An update of the 1987 task force recommendations. *Pediatrics*. 2011;128(3):e720-e740. https://pediatrics.aappublications.org/content/128/3/e720. 2021. ● World Health Organization. International Guidelines for the Determination of Death – Phase I. https://www.who.int/patientsafety/montreal-forum-report.pdf. 2021.

Medical Knowledge 1: Development and Behavior	
Overall Intent: To demonstrate sufficient knowledge to counsel families regarding common disorders of motor, emotional, cognitive, and behavioral development	
Milestones	**Examples**
Level 1 *Lists developmental norms across domains*	● Cites different expectations for development and behavior at different points in the lifespan, including normal acquisition of milestones ● Discusses that children typically roll by six months and walk by 15 months
Recognizes that all streams of development evolve across the lifespan	● Recognizes that children's behavior might change over time but cannot give concrete examples
Level 2 *Identifies signs and patterns of abnormal development*	● Recognizes that children growing up in a bilingual household should not delay language acquisition
Discusses normal neurodevelopment across the lifespan	● Discusses development of stranger anxiety ● Discusses that teenagers placing less value on parent's values than on peers is typical
Level 3 *Interprets patterns of abnormalities across the streams of development*	● Characterizes findings into context (e.g., isolated speech/language delay versus global developmental delay) and has appropriate knowledge to counsel families about abnormal findings
Discusses abnormal neurodevelopment across the lifespan	● Discusses slower attainment of motor milestones in patients with hypotonia ● Discusses how a child having trouble at school may indicate a learning disability
Level 4 *Counsels families regarding common and uncommon disorders of neurodevelopment across the lifespan*	● Goes beyond putting abnormal findings into context and discusses specific trajectories of common disorders
Anticipates associated developmental disorders based on patterns of abnormalities	● Describes that children with cerebral palsy may have some functional improvement with therapies but may still have an increasing gap between their functioning and that of their classmates as the classmates learn to do more advanced skills (e.g., soccer)
Level 5 *Serves as a role model to counsel families regarding uncommon disorders of development across the lifespan*	● Counsels families about a new diagnosis of intellectual disability, including etiologic evaluation, management strategies and prognosis
Assessment Models or Tools	● Direct observation ● Mock oral examination ● Simulations
Curriculum Mapping	●
Notes or Resources	● Menkes JH. *Textbook of Child Neurology*. 5th ed. Williams and Wilkins; 1995. ISBN:978-0683059205.

	● Neurology. https://n.neurology.org/. 2021.
	● Pediatric Neurology. https://www.pedneur.com/. 2021.
	● Swaiman KF, Ashwal S, Ferriero DM, Schor N. *Swaiman's Pediatric Neurology*. 6th ed. Philadelphia, PA: Elsevier; 2017. ISBN:978-0323371018.
	● Accardo P, Accardo J, Allen M, et al. *Capute & Accardo's Neurodevelopmental Disabilities in Infancy and Childhood: Neurodevelopmental Diagnosis and Treatment (Volume 1)*. 3rd ed. Paul H. Brookes Publishing Co, Baltimore, MD; 2008

Medical Knowledge 2: Localization	
Overall Intent: To localize neurologic deficits to specific locations in the nervous system and apply their hypothesis to patient management	

Milestones	Examples
Level 1 Localizes signs and symptoms to general regions of the nervous system	● Hypothesizes that a patient with asymmetric hand usage, upgoing toe, ankle clonus, and asymmetric knee reflexes likely has spastic hemiplegia in association with a contralateral upper motor neuron lesion
Level 2 *Localizes signs and symptoms to specific regions of the nervous system*	● Discusses how a patient with spastic cerebral palsy and choreoathetosis localizes to the basal ganglia
Level 3 *Localizes signs and symptoms to discrete structures of the nervous system, recognizing challenges in precise localization of lesions in infants and children*	● Expectant management of spina bifida patients with bowel and bladder management ● Differentiates central vs peripheral hypotonia in infants ● Develops hypothesis for seizure localization in first encounter
Level 4 *Precisely localizes signs and symptoms and describes the impact on patient management*	● Differentiates brachial plexus injury vs hemiplegic cerebral palsy in asymmetric upper extremity use in infant and makes appropriate diagnostic and referral recommendations
Level 5 *Role models the precise localization of complex signs and symptoms to discrete structures of the nervous system*	● Is sought out by other learners for an opinion when attempting to localize the source of neurologic deficits in a challenging case
Assessment Models or Tools	● Direct observation ● In training examination; neuroanatomy section ● Medical record (chart) audit ● Mock oral examination
Curriculum Mapping	●
Notes or Resources	● Blumenfeld H. *Neuroanatomy through Clinical Cases*. 2nd ed. Sunderland, MA: Sinauer Associates; 2010. ISBN:978-0878936137. ● O'Brien M. *Aids to the Examination of the Peripheral Nervous System*. 5th ed. Philadelphia, PA: Elsevier; 2010. ISBN:978-0702034473

Neurodevelopmental Disabilities Supplemental Guide

Medical Knowledge 3: Neuroimaging	
Overall Intent: To use and interpret developmental and acquired abnormalities on neuroimaging	

Milestones	Examples
	A patient with a subtle malformation of the perisylvian gyri (Perisylvian polymicrogyria) (Vignette/Scenario for Levels 1-5)
Level 1 *Identifies normal neuroanatomy on brain and spine magnetic resonance (MR) and computed tomography (CT)*	● Identifies brain anatomy as it appears in all planes
Level 2 *Describes major abnormalities of the brain, spine, and neurovasculature on MR and CT*	● Identifies abnormalities such as agenesis of corpus callosum, schizencephaly, and holoprosencephaly ● Describes size, location, and characteristics of a large posterior fossa lesion
Level 3 *Describes normal developmental changes on MR and CT and interprets subtle abnormalities of the brain, spine, and neurovasculature on imaging*	● Suggests that an enlarged sylvian fissure is abnormal and identifies the cortical ribbon as normal or not ● Compares the normal and abnormal signal intensities in the areas in question ● Identifies changes in myelination patterns over the first two years of life
Level 4 *Interprets common clinical neuroimaging modalities with indirect supervision and identifies the indications for advanced neuroimaging techniques*	● Correctly diagnoses perisylvian polymicrogyria based on imaging findings
Level 5 *Interprets rare and complex findings on neuroimaging, and serves as a resource for colleagues or conducts research using neuroimaging*	● Consistently diagnoses a variety of leukodystrophies based on imaging alone
Assessment Models or Tools	● Assessment during case conferences ● Direct observation ● Mock oral examination ● OSCEs
Curriculum Mapping	●
Notes or Resources	● The neuroradiologist is often able to question the residents about findings in the setting of regular neuroradiology conferences ● Neurology. https://n.neurology.org/. 2021. ● Pediatric Neurology. https://www.pedneur.com/. 2021. ● Radiopedia. https://radiopaedia.org/?lang=us. 2021.

Medical Knowledge 4: Electromyography	
Overall Intent: To interpret results of nerve conduction study/electromyogram testing	

Milestones	Examples
Level 1 *Describes general indications for nerve conduction studies/electromyography tests*	● Discusses the use of nerve conduction study/electromyogram in diagnosis of disorders of the peripheral nervous system ● Recognizes that an electromyogram can find abnormalities such as compression of the median nerve at the wrist
Level 2 *Describes patterns seen on nerve conduction studies/electromyography related to localization*	● Describes the pattern of fibrillation and positive sharp waves seen in infantile spinal muscular atrophy
Level 3 *Plans nerve conduction studies/electromyography in the context of the clinical presentation*	● Recognizes the importance of specialized electromyographic techniques in distinguishing myasthenia from other myopathic processes
Level 4 *Interprets results of nerve conduction studies/electromyography testing in the context of the clinical presentation*	● Uses electromyography/nerve conduction velocity test data to plan multidisciplinary approach for child with brachial plexus injury
Level 5 *Conducts research that uses nerve conduction studies/electromyography data*	● Studies peripheral neuropathy in leukodystrophy or myelopathy in adults with Down syndrome who have atlantoaxial instability
Assessment Models or Tools	● Assessment of case conferences ● Clinical discussions on inpatient and outpatient rotation experiences ● Direct observation ● Simulation
Curriculum Mapping	●
Notes or Resources	● Darras BT, Royden Jones T, Ryan M, et al. *Neuromuscular Disorders of Infancy, Childhood, and Adolescence.* 2nd ed. Philadelphia, PA: Elsevier; 2015. ISBN:978-0-12-417044-5. ● Kumbhare D, Robinson L, Buschbacher R. *Buschbacher's Manual of Nerve Conduction Studies.* 3rd ed. New York, NY: Demos Medical Publishing LLC; 2015. ISBN:978-1620700877. ● Holmes, GL, Moshe SL, Royden Jones, H. *Clinical Neurophysiology of Infancy, Childhood and Adolescence.* Philadelphia, PA: Elsevier; 2006. ISBN:978-0-7506-7251-1. ● Preston DC, Shapiro BE. Clinical-electrophysiologic correlations: Overview and common patterns. In: Preston DC, Shapiro BE. *Electromyography and Neuromuscular Disorders: Clinical-Electrophysiologic Correlations.* 3rd ed. Philadepia, PA: Elsevier; 2013. ISBN:978-1455726721.

Medical Knowledge 5: Diagnostic Investigation	
Overall Intent: To implement a targeted, cost-effective plan for high-yield diagnostic testing in patients with neurologic complaints	

Milestones	Examples
Level 1 *Discusses general diagnostic approach appropriate to clinical presentation*	● Determines that a patient with hemiplegia and aphasia should have imaging of the brain
Level 2 *Lists indications, contraindications, risks, and benefits of diagnostic testing*	● Describes when a lumbar puncture may be indicated in a patient with fever and altered mental status ● Discusses how iodinated contrast material may cause nephropathy in patients with impaired kidney function ● Identifies that a benefit of a cerebral angiogram is identification of aneurysms or other vascular malformations that may require treatment to prevent catastrophic rupture ● Informs families of possible results of genetic testing, including positive findings, negative findings, variants of uncertain significance, and potential unintended findings (other genetic abnormalities such as those predisposing to cancer risk, non-paternity, and consanguinity)
Level 3 *Prioritizes and interprets diagnostic tests appropriate to clinical urgency and complexity*	● Discusses how a patient with papilledema and decreased vision who is suspected to have intracranial hypertension needs urgent imaging of the brain to rule out a space-occupying lesion and venous sinus thrombosis before a lumbar puncture is performed ● After negative imaging, the lumbar puncture is performed, opening pressure is 35 and cerebrospinal fluid analysis is unremarkable. The resident understands that the high opening pressure and normal cerebrospinal fluid support the diagnosis of idiopathic intracranial hypertension ● Uses a step-wise diagnostic approach in the evaluation of a child with global developmental delay or intellectual disability ● Orders a serum creatine kinase (CK) level in a child with delayed walking skills
Level 4 *Uses complex diagnostic approaches that have the highest diagnostic yield and cost effectiveness*	● Orders Duchenne muscular dystrophy deletion/duplication testing instead of ordering whole exome sequencing for a child with delayed walking and a creatine kinase level of 30,000 ● Counsels a migraine patient on why an MRI of the brain is not indicated in their condition ● Orders a head ultrasound in a neonate with suspected hydrocephalus instead of an MRI of the brain ● Orders epilepsy monitoring unit monitoring for a patient with suspected recurrent clinical seizure activity unresponsive to escalating therapies in the setting of normal routine and ambulatory EEG studies
Level 5 *Demonstrates sophisticated knowledge of diagnostic testing and controversies*	● Directs other team members in diagnostic testing of complex cases

	● Interprets advanced diagnostic testing used for pre-surgical work-up of intractable epilepsy
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit
Curriculum Mapping	●
Notes or Resources	● Adam MP, Ardinger HH, Pagon RA, et al. *Gene Reviews*. Seattle, WA: University of Washington; 1993-2019. https://www.ncbi.nlm.nih.gov/books/NBK1116/. 2021. ● Gifford DR, Mittman BS, Vickrey BG. Diagnostic reasoning in neurology. *Neurologic Clinics*. 14(1):223-238. https://pubmed.ncbi.nlm.nih.gov/8676845/. 2021. ● Preston DC, Shapiro BE. *Electromyography and Neuromuscular Disorders: Clinical-Electrophysiologic Correlations.* 3rd ed. Philadepia, PA: Elsevier; 2013. ISBN:978-1455726721. ● Du Plessis AJ, Limperopoulos C, Volpe JJ. Cerebellar development. In: Volpe JJ. *Neurology of the Newborn*. 6th ed. Philadelphia, PA: Elsevier; 2017:73.

Systems-Based Practice 1: Patient Safety	
Overall Intent: Engages 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 common patient safety events* *Demonstrates knowledge of how to report patient safety events* *Recognizes that most safety events are the result of system failure and not human error*	● Recognizes that multiple subtherapeutic doses of benzodiazepines put a patient at risk for continued seizure and also respiratory suppression, knows there is an online system for error reporting in the hospital but has not yet used it, and knows to speak to the emergency room physician about the patient safety event but may require guidance from the attending in how to approach this ● Recognizes that incorrect medication dose administration may be related to systems-based errors, such as electronic health record (EHR) order entry, as opposed to the pharmacist incorrectly sending the wrong dose to the emergency department
Level 2 *Identifies system factors that lead to patient safety events* *Reports patient safety events through institutional reporting systems (simulated or actual)* *Demonstrates a non-accusatory, non-judgmental attitude in dealing with issues of patient safety*	● Identifies that the lack of a protocol for status epilepticus in the emergency room may have contributed to this patient safety event ● Records the event in the hospital's online anonymous event reporting database ● When investigating a patient safety issue, the resident's tone is directed towards identifying system-based errors and prevention of recurrence
Level 3 *Participates in analysis of patient safety events (simulated or actual)* *Participates in disclosure of patient safety events to patients and families (simulated or actual)* *Presents at a morbidity and mortality conference*	● Organizes the data to evaluate a patient safety event so that others can provide interpretation ● Participates in communication with patients/families about the event with available supervision ● Prepares and participates in a morbidity and mortality conference
Level 4 *Conducts analysis of patient safety events and offers error prevention strategies (simulated or actual)* *Discloses patient safety events to patients and families (simulated or actual)*	● Collaborates with a team to analyze a patient safety event to identify errors and formulate prevention strategies ● Competently communicates with patients/families about those events

Participates as a member of a team investigating a patient safety issue	● Working with a team to gather data to investigate an event and formulate recommendations for future prevention
Level 5 *Actively engages teams and processes to modify systems to prevent patient safety events*	● Assumes a leadership role at the departmental or institutional level for patient safety and/or QI initiatives
Models or mentors others in the disclosure of patient safety events	● Coaches a more junior resident on disclosure of medical errors in an actual or simulated setting
Evaluates the effectiveness of systems changes implemented as a result of patient safety activities	● Conducts a retrospective review after systems changes are implemented
Assessment Models or Tools	● Direct observation ● E-module multiple choice tests ● Multisource feedback ● Portfolio review ● Simulation ● System documentation of safety reporting
Curriculum Mapping	●

Notes or Resources	● American Medical Association (AMA). AMA Graduate Medical Education (GME) Competency Education Program. https://edhub.ama-assn.org/gcep. 2021.
	    ○ Modules on patient safety
	    ○ Modules on quality improvement
	● Agency for Healthcare Research and Quality (AHRQ). Programs. https://www.ahrq.gov/programs/index.html?search_api_views_fulltext=&field_program_topics=14177. 2021.
	● Institute of Healthcare Improvement. http://www.ihi.org/Pages/default.aspx. 2021.

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*	● Describes the Plan-Do-Study-Act (PDSA) methodology of QI
Level 2 *Describes local quality improvement initiatives (e.g., public health measures)*	● Describes a related QI project in the hospital
Level 3 *Participates in local quality improvement initiatives*	● Participates in a QI project, regarding the prescribing habits of physicians providing stimulant prescriptions and following safety measures ● Evaluates bladder infection rates associated with catherization in children with spina bifida
Level 4 *Demonstrates the skills required to identify, develop, implement, and analyze a quality improvement project*	● Recruits a team to conduct a review of accurate medication reconciliation in the EHR during outpatient visits ● Develops a system to provide timely and comprehensive genetic testing results to patients and families
Level 5 *Creates, implements, and assesses quality improvement initiatives at the institutional or community level*	● Develops a documentation template for telehealth visits for children with multi-system health needs ● Collaborates with other team members to develop a patient and family satisfaction survey and take steps to develop interventions to address identified areas of weakness
Assessment Models or Tools	● Direct observation ● E-module multiple choice tests ● Multisource feedback ● Portfolio review ● Simulation ● System documentation of safety reporting
Curriculum Mapping	●

Notes or Resources	● American Medical Association (AMA). AMA Graduate Medical Education (GME) Competency Education Program. https://edhub.ama-assn.org/gcep. 2021.
	   ○ Modules on patient safety
	   ○ Modules on quality improvement
	● AHRQ. Programs. https://www.ahrq.gov/programs/index.html?search_api_views_fulltext=&field_program_topics=14177. 2021.
	● Institute of Healthcare Improvement. http://www.ihi.org/Pages/default.aspx. 2021.

Systems-Based Practice 3: Systems of Care Delivery: Patient- and Family-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 *Describes the role of interdisciplinary team members*	● Identifies social work and discharge planning needs during patient care rounds
Demonstrates knowledge of care coordination	● Lists adverse outcomes that can result from lack of prioritized care
Defines "family" for individual patients and lists the various roles that families play in care delivery and decision making	● Identifies primary decision maker within the "family"
Level 2 *Demonstrates an attitude of mutual respect for other members of the interdisciplinary team*	● Participates in an interdisciplinary team meeting to prioritize and coordinate care
Coordinates care of patients in routine clinical situations effectively using the roles of the interprofessional teams	● Appropriately consults social work, and rehabilitation therapists to develop a comprehensive management plan for a child with cerebral palsy
Listens carefully to patients' families, with sensitivity to each family's values and customs	● Asks families how they prefer information to be transmitted (e.g., phone, electronic, in person) and to which family member
Level 3 *Participates in interdisciplinary care activities*	● Works with nutrition, respiratory therapy, and physical therapy to optimize care for a patient with a new diagnosis of spinal muscular atrophy and severe malnutrition
Coordinates care of patients in complex clinical situations effectively using the roles of their interprofessional teams	● Reviews patient care plans and progress during multidisciplinary care conference and contributes recommendations
Provides timely, complete, and accurate information to patients' families in a manner that would enable participation in care and decision making	● Provides information about resources about obtaining an educational advocate to help with Individualized Education Plan (IEP) concerns
Level 4 *Leads interdisciplinary teams*	● Leads the discussion in an interprofessional discharge planning conference for a patient with complex psychosocial issues

Demonstrates effective coordination of patient-centered care among different disciplines and specialties	● Calls the primary care doctor for a patient newly diagnosed with infantile spasms to discuss potential complications and dosing of steroid treatment ● Coaches a more junior resident on how to communicate with the adult neurologist and family to transition a patient with intellectual disability and epilepsy to adult neurology
Collaborates with families in the development and implementation of care management programs	● Assists family to obtain overnight nursing care for a child with a tracheostomy needing respiratory care which enables the family to rest
Level 5 *Teaches and mentors interdisciplinary leaders*	● Works with genetic counsellors to develop interdisciplinary skills and enable them to recognize neurodevelopmental dysfunction seen in children with complex genetic disorders
Analyzes the process of care coordination and leads in the design and implementation of care system improvements	● Works with a QI mentor to identify better hand-off tools for transition to adult care
Involves families in the development and implementation of teaching and research activities	● Conducts a needs assessment of an underserved population and designs an educational intervention to address medication non-adherence
Assessment Models or Tools	● Direct observation ● Medical record (chart) review ● Multisource feedback ● OSCEs ● Quality metrics ● Review of sign-out tools
Curriculum Mapping	●
Notes or Resources	● CDC. Population Health Training in Place Program (PH-TIPP). https://www.cdc.gov/pophealthtraining/whatis.html. 2021. ● Skochelak SE, Hawkins RE, Lawson LE, Starr SR, Borkan JM, Gonzalo JD. *AMA Education Consortium: Health Systems Science*. Philadelphia, PA: Elsevier; 2016. https://commerce.ama-assn.org/store/ui/catalog/productDetail?product_id=prod2780003. 2021.

Systems-Based Practice 4: Physician Role in Health Care Systems	
Overall Intent: To understand one's own role in the treatment team and 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 *Identifies key components of the complex health care system (e.g., hospital, skilled nursing facility, finance, personnel, technology)*	● Lists hospital, skilled nursing facility, finance, personnel, and technology as components of the health care system
Describes basic health payment systems (e.g., government, private, public, uninsured care) and practice models	● Recognizes there are different payment systems, such as managed care systems, Medicaid, and commercial third-party payors ● Knows that there are different requirements for coding different levels of service
Level 2 *Describes how components of a complex health care system are interrelated, and how this impacts patient care*	● Understands that when a 10-year-old child needs an MRI of the brain and the hospital is not in the preferred network for this patient, the insurance company may not allow an MRI to be ordered without a peer-to-peer consultation ● Arranges to have the MRI performed at an in-network facility so it can be covered by insurance
Discusses conceptual components of delivering the right care at the right time meeting patient's immediate and longer-term needs	● Lists medication and allergy reconciliation and updating the problem list as being required every visit
Level 3 *Discusses how individual practice affects the broader system (e.g., length of stay, readmission rates, clinical efficiency)*	● Knows that a late discharge impacts new patient admissions
Advocates for patient care needs (e.g., community resources, patient assistance resources) with consideration of strengths and challenges of patient, family, and environment	● Discusses other options with the patient when their insurance does not cover rizatriptan ● Codes an encounter at a Level 4 and elements of their notes supports this level of service
Level 4 *Manages various components of the complex health care system to provide efficient and effective patient care and transition of care*	● Works collaboratively with the institution to improve patient assistance resources or designs the institution's community health needs assessment ● Provides documentation for need of lacosamide for a patient with intractable focal epilepsy ● Finds a resource for free gene testing in a child
Discuss means of effecting systemic change in health care costs and care delivery	● Asks social worker to suggest low-cost psychological therapy for patients

	● Reviews previous continuity clinic patients with seizures to determine the number with seizure action plans ● Identifies a pattern of prolonged patient visits and level of billing
Level 5 *Advocates for or leads systems change that enhances high-value, efficient, and effective patient care and transition of care* *Participates in health policy advocacy activities*	● Develops an institutional protocol regarding the neuroimaging of patients with particular types of headaches and addresses neuroimaging as it relates to delivering high-value care ● Improves informed consent process for non-English-speaking patients requiring interpreter services
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Portfolio review
Curriculum Mapping	●
Notes or Resources	● AAN. Neurology career center. https://careers.aan.com/. 2021. ● AHRQ. Measuring the Quality of Physician Care. https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/physician/challenges.html. 2021. ● AHRQ. Major Physician Performance Sets. https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/physician/measurementsets.html. 2021. ● The Commonwealth Fund. Health System Data Center. http://datacenter.commonwealthfund.org/?_ga=2.110888517.1505146611.1495417431-1811932185.1495417431#ind=1/sc=1. 2021. ● Dzau VJ, McClellan M, Burke S, et al. Vital directions for health and health care: priorities form a national academy of medicine initiative. *JAMA*. 2017;317(14):1461-1470. https://nam.edu/vital-directions-for-health-health-care-priorities-from-a-national-academy-of-medicine-initiative/. 2021. ● The Kaiser Family Foundation. Health Reform. https://www.kff.org/topic/health-reform/. 2021.

Systems-Based Practice 5: Community Resources	
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 *Describes educational, mental health, rehabilitation, and community support resources for patients with neurodevelopmental disabilities ranging across the lifespan*	● Identifies access to primary care and insurance status as social determinants of health
Recognizes that most treatment for neurodevelopmental disabilities is provided in the community by community resources	● Identifies available county- or state-based developmental services and resources
Level 2 *Makes initial referrals to educational, mental health, rehabilitation, and community support resources for patients with neurodevelopmental disabilities ranging across the lifespan*	● Refers families to appropriate county- or state-based services (e.g., Early Intervention, Birth to 3) ● Identifies that the hospital serves a large, low-income, rural area without good public transportation and because of this, many patients have difficulty with making appointments, going to therapy, or accessing medications
Discusses relevant laws that guide the care of people with neurodevelopmental disabilities	● Counsels patients and families on the right to free and appropriate public education ● Counsels family of child with severe intellectual disability (ID) and autism spectrum disorder (ASD) on available Medicaid waiver programs and waitlists
Level 3 *Makes more complex referrals with requests for specific interventions to educational, mental health, rehabilitation, and community support resources for patients with neurodevelopmental disabilities ranging across the lifespan*	● Provides information about resources for a local food bank and dental clinic near the patient's home when managing patients in continuity clinic ● Refers a patient with communication disorder for augmentative and alternative communication providers
Participates in a community meeting (e.g., individualized education plan, parent group, etc.)	● Attends an IEP meeting for a patient
Level 4 *Consistently demonstrates competence in referring and coordinating services*	● Collaborates with patients and families to identify and refer to service providers near the patient's home
Evaluates the strengths, challenges, and effectiveness of the community resources to which patients are referred	● In the continuity clinic, considers best way to present information to patients, families, and others based on literacy and cognition levels ● Uses other professionals to help obtain additional resources for patients with limited local access to therapy

Level 5 *Participates in leadership role in educational, mental health, rehabilitation, and community support resources for patients with neurodevelopmental disabilities* *Engages in scholarly projects regarding integration of medical, educational, mental health, rehabilitation, and community support resources for patients with neurodevelopmental and related disabilities*	● Identifies needs of the refugee population in continuity clinic and designs a home visit program to improve medication adherence ● Collaborates with their hospital's pediatric mobile clinic to provide neurodevelopmental services to the underserved and uninsured community ● Develops educational materials on COVID-19 vaccination for patients with limited literacy
Assessment Models or Tools	● Direct observation ● Medical record (chart) review ● Multisource feedback ● OSCEs ● Quality metrics
Curriculum Mapping	●
Notes or Resources	● ADA. A Guide to Disability Rights Laws. https://www.ada.gov/cguide.htm. 2021. ● CDC. Population Health Training. https://www.cdc.gov/pophealthtraining/whatis.html. 2021. ● Skochelak SE, Hawkins RE, Lawson LE, Starr SR, Borkan JM, Gonzalo JD. *AMA Education Consortium: Health Systems Science*. Philadelphia, PA: Elsevier; 2016. https://commerce.ama-assn.org/store/ui/catalog/productDetail?product_id=prod2780003. 2021. ● USA.Gov. Your Legal Disability Rights. https://www.usa.gov/disability-rights. 2021.

Systems-Based Practice 6: Diversity and Equity that Impact Neurodevelopmental Access and Outcomes **Overall Intent:** To recognize and minimize the impact of adverse social determinants of health on management programs	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of population and community health needs and disparities* *Recognizes inequalities in care and clinical outcomes for persons with neurodevelopmental disabilities*	● Understands local patient population demographics ● Identifies limited English proficiency as a barrier to accessing care ● Uses an interpreter for any patient whose primary language is not English
Level 2 *Identifies specific population and community health needs and inequities for their local population* *Identifies specific barriers and factors leading to inequality in care and clinical outcomes for persons with neurodevelopmental disabilities*	● Finds that patients requiring medical transport to attend visits miss more clinic visits than patients with personal means of transportation ● Discusses with families what they perceive to be the greatest barriers to accessing care ● Recognizes that communication barriers exist even with use of interpreter ● Refers Spanish-speaking family specifically to the neuropsychologist who can provide dual-language services and testing in Spanish
Level 3 *Uses local resources effectively to meet the needs of a patient population and community* *Identifies available resources to reduce barriers and system limitations to promote equality in care and clinical outcomes*	● Locates and refers to primary care providers who are adept at managing care for children with complex medical needs ● Refers patients to clinical social workers to assist in connecting families to resources ● Works with care coordinators to ensure adherence to follow-up plans ● Ensures patients have access to appropriate communication supports during medical care
Level 4 *Participates in changing and adapting practice to provide for the needs of specific populations* *Incorporates appropriate internal and external resources to reduce barriers and system limitations to promote equality in care and clinical outcomes*	● Advocates for a condition-specific interdisciplinary clinic to facilitate care and reduce travel burden for patients with complex medical needs at systems level (e.g. hospital, community) ● Provides consultative guidance and collaboration with patient case workers to facilitate follow-up care and coordinate complex referrals
Level 5 *Leads innovations and advocates for populations and communities with health care inequities*	● Participates in research project assessing barriers to care in children with complex medical needs

Participates in regional and national advocacy and research to ensure equity of care and clinical outcomes	
Assessment Models or Tools	● Direct observation ● Medical record (chart) review ● Multisource feedback ● OSCEs ● Quality metrics
Curriculum Mapping	●
Notes or Resources	● Tomoaia-Cotisel A, Farrell TW, Solberg LI, et al. Implementation of care management: an analysis of recent AHRQ research. *Med Care Res Rev*. 2018 Feb;75(1):46-65. doi: 10.1177/1077558716673459. Epub 2016 Oct 23.

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<table>
<tr><td colspan="2">Practice-Based Learning and Improvement 1: Evidence-Based and Informed Practice
Overall Intent: To incorporate evidence into clinical practice</td></tr>
<tr><td>Milestones</td><td>Examples</td></tr>
<tr><td>Level 1 <i>Uses available evidence to care for a routine patient</i></td><td>● Searches for review article on Duchenne muscular dystrophy</td></tr>
<tr><td>Level 2 <i>Articulates clinical questions to guide evidence-based care</i></td><td>● Search for evidence for use of steroids in Duchenne muscular dystrophy</td></tr>
<tr><td>Level 3 <i>Locates and applies the best available evidence</i></td><td>● Uses clinical practice guideline from American Academy of Neurology (AAN) to treat patients with Duchenne muscular dystrophy</td></tr>
<tr><td>Level 4 <i>Critically appraises and applies evidence to guide care, even in the face of uncertainty and conflicting evidence</i></td><td>● Reviews and analyzes a primary research article on the treatment of Duchenne muscular dystrophy that contradicts current practice
● Reviews multiple articles on treatment of infantile spasms to determine appropriate treatment</td></tr>
<tr><td>Level 5 <i>Coaches others to critically appraise and apply evidence for complex patients, and/or participates in the development of guidelines</i></td><td>● Coaches or is sought out by others in analyzing research
● Reviews literature to update departmental protocols</td></tr>
<tr><td>Assessment Models or Tools</td><td>● Direct observation
● Journal club
● Oral or written examination
● Portfolio review
● Presentation</td></tr>
<tr><td>Curriculum Mapping</td><td>●</td></tr>
<tr><td>Notes or Resources</td><td>● Institutional IRB guidelines
● National Institutes of Health. Write Your Application. https://grants.nih.gov/grants/how-to-apply-application-guide/format-and-write/write-your-application.htm. 2021.
● U.S. National Library of Medicine. PubMed Tutorial. https://www.nlm.nih.gov/bsd/disted/pubmedtutorial/cover.html. 2021.
● Various journal submission guidelines</td></tr>
</table>

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 a personal learning goal for the next year ● Identifies that too much time is spent on notes ● Asks attending for tips on efficient note writing
Level 2 *Accepts performance data (feedback and other input) and uses it to develop a learning plan*	● Asks follow-up questions regarding how to improve after receiving feedback ● Identifies that too much time spent on notes impacts other aspects of patient care ● At the suggestion of the attending, uses a note template
Level 3 *Seeks performance data and develops a learning plan with increasing independence*	● At the end of a particularly difficult rotation, asks for feedback; does not seek feedback for a rotation perceived to be easy ● Tracks the time spent on notes to recognize improved efficiency ● Independently creates a note template to improve efficiency of documentation
Level 4 *Regularly measures oneself against the learning plan, modifying the plan when necessary*	● At the end of all rotations, seeks out and uses feedback on performance ● Works with information technology (IT) to improve note template after recognizing that documentation is still inefficient ● Gets quality monitoring reports from IT to review the learning plan
Level 5 *Models creation, implementation, analysis, and modification of learning plans, incorporating performance data*	● Asks more junior learners for feedback and asks for feedback from faculty members in front of more junior learners ● 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. 2021. ● Hojat M, Veloski JJ, Gonnella JS. Measurement and correlates of physicians' lifelong learning. *Academic Medicine*. 2009;84(8):1066-1074. https://journals.lww.com/academicmedicine/fulltext/2009/08000/Measurement_and_Correates_of_Physicians__Lifelong.21.aspx. 2021.

	● Lockspeiser TM, Schmitter PA, Lane JL, Hanson JL, Rosenberg AA, Park YS. Assessing residents' written learning goals and goal writing skill: Validity evidence for the learning goal scoring rubric. *Academic Medicine*. 2013;88(10):1558-1563. https://journals.lww.com/academicmedicine/fulltext/2013/10000/Assessing_Residents__Written_Learning_Goals_and.39.aspx. 2021.

Professionalism 1: Professional Behavior	
Overall Intent: To recognize and address lapses in professional behavior, demonstrates professional behaviors, and use appropriate resources for managing professional dilemmas	

Milestones	Examples
Level 1 *Identifies and describes potential triggers for professionalism lapses and how to act upon professionalism lapses*	● Identifies that professionalism impacts patient outcomes ● Identifies that stressors such as sleep deprivation and home stress can be potential triggers for professionalism lapses
Level 2 *Demonstrates professional behavior in routine situations and takes responsibility for one's own professionalism lapses*	● Is usually prepared and on time and when late, apologizes to the team ● Identifies procedures for dealing with unprofessional behavior, including ethics team, ombudsmen, and peer review
Level 3 *Demonstrates professional behavior in complex or stressful situations*	● Remains an active listener to concerns when divorced parents of a patient disagree on next steps in care ● During night coverage, receives multiple pages and must prioritize responses
Level 4 *Recognizes situations that may trigger professionalism lapses and/or intervenes to prevent lapses in oneself and others*	● Offers to complete admissions for another resident who has had a busy call night so the colleague can return home to sleep ● Works to improve work distribution and call schedule to reduce resident fatigue
Level 5 *Coaches others when their behavior fails to meet professional expectations*	● Coaches a colleague who is disrespectful to a consulting service how to help their behavior meet professional expectations
Assessment Models or Tools	● Direct observation ● Multisource feedback ● Oral or written self-reflection (e.g., of a personal or observed lapse, ethical dilemma, or systems-level factors) ● Simulation
Curriculum Mapping	●
Notes or Resources	● American Medical Association. Ethics. http://www.ama-assn.org/delivering-care/ethics. 2021. ● 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. 2021. ● 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. 2021.

Professionalism 2: Ethical Principles	
Overall Intent: To recognize and address lapses in ethical behavior, demonstrates ethical behaviors, and use appropriate resources for managing ethical dilemmas	

Milestones	Examples
Level 1 *Demonstrates knowledge of fundamental ethical principles*	● Discusses the basic principles underlying ethics (autonomy, beneficence, non-maleficence, justice) and professionalism (professional values and commitments)
Level 2 *Analyzes straightforward situations using ethical principles and recognizes the need to seek help in managing and resolving complex ethical situations*	● Refuses to prescribe a stimulant to a student who does not have ADHD but wants to do better in math ● Contacts the ethics committee when a patient in the ICU is on a ventilator and the parents disagree about the next steps
Level 3 *Analyzes complex situations using ethical principles*	● Demonstrates understanding of autonomy and beneficence when explaining to a 17-year-old patient with intellectual disability why the patient needs surgery as part of obtaining informed consent
Level 4 *Recognizes and uses appropriate resources for managing and resolving ethical dilemmas as needed*	● Suggests to an attending that an ethics consultation may be warranted in the case of a 10-year old visiting from a resource-poor country who needs a feeding gastrostomy tube placed due to dysphagia
Level 5 *Identifies and seeks to address system-level factors that induce or exacerbate ethical problems or impede their resolution*	● Seeks to develop an institutional protocol for informed consent in patients with intellectual disability
Assessment Models or Tools	● Direct observation ● Multisource feedback ● Oral or written self-reflection (e.g., of a personal or observed lapse, ethical dilemma, or systems-level factors) ● Simulation
Curriculum Mapping	●
Notes or Resources	● American Medical Association. Ethics. http://www.ama-assn.org/delivering-care/ethics. 2021. ● 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. 2021. ● 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. 2021.

Professionalism 3: 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 and proposes using multiple alarm clocks to remedy the situation
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*	● Communicates results to outpatients in a timely fashion ● Addresses inbox before leaving for vacation
Recognizes situations that may impact one's 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 resident 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 residents or faculty members, if needed
Proactively implements strategies to ensure the needs of patients, teams, and systems are met	● When post call or on vacation, arranges for cross coverage, communicates with office staff, and creates an out of office message
Level 4 *Manages situations that may impact others' ability to complete tasks and responsibilities in a timely manner*	● Senior residents advise junior residents how to manage their time in completing patient care tasks; escalates to communicating with program director if problem requires a system-based approach and needs addressing at a higher administrative level
Models the strategies to ensure the needs of patients, teams, and systems are met	● Anticipates potential adverse outcomes and needs (physical, social, economic, etc.) and discusses with the multidisciplinary team for a patient with a new diagnosis of a neurodegenerative disorder
Level 5 *Identifies and seeks to address system-level factors that impact completion of tasks*	● Sets up a meeting with the nurse manager to streamline patient discharges

Coaches others to develop strategies to ensure the needs of patients, teams, and systems are met	● Coaches junior residents to do a QI project to improve clinic workflow and tracking diagnostic results
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. AMA GME Competency Education Program. https://edhub.ama-assn.org/gcep. 2021. ○ Modules on professionalism ● 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. 2021. ● Code of conduct from fellow/resident institutional manual ● Expectations of residency 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. 2021.

Professionalism 4: 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 *With assistance, recognizes status of personal and professional well-being*	● Accepts feedback and exhibits positive responses to constructive criticism or suggestions for change
Level 2 *Independently recognizes status of personal and professional well-being*	● Recognizes when other team members are sleep deprived
Level 3 *With assistance, proposes a plan to promote personal and professional well-being*	● With guidance from the program director, makes room in daily schedule for personal time and hobbies
Level 4 *Independently develops a plan to promote personal and professional well-being*	● Arranges for team-building activities to help reduce stress
Level 5 *Supports the departmental well-being program*	● Mentors colleagues in self-awareness and establishes plans to limit stress and burnout ● Provides leadership to departmental wellness activities
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. Rather, the intent is to ensure that each fellow has the fundamental knowledge of factors that affect well-being, the mechanisms by which those factors affect well-being, and available resources and tools to improve well-being. ● American Academy of Neurology. Residency Program Wellness. https://www.aan.com/tools-and-resources/academic-neurologists-researchers/program-and-fellowship-director-resources/residency-program-wellness/. 2021. ● ACGME. "Well-Being Tools and Resources." https://dl.acgme.org/pages/well-being-tools-resources. 2021.

	● 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. 2021. ● 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/. 2021.

Professionalism 5: Patient Care Etiquette with Patients of All Abilities	
Overall Intent: To attend to the comfort and dignity of all patients regardless of any impairment or disability	

Milestones	Examples
Level 1 *Recognizes the need to respect the dignity of all patients regardless of impairments or disabilities*	● Understands that all patients should be treated with respect, with due attention to their comfort and dignity, regardless of disability
Level 2 *Demonstrates specific elements of verbal and physical communication that reflect respect for people with impairments or disabilities*	● Sits at the level of a wheelchair for conversation with a patient who uses a wheelchair ● Treats the wheelchair as part of the patient's personal space ● Talks directly to the person with disability not through a caregiver or companion ● Uses language that emphasizes the individual person and not just the disability when referring to the patient ("a person with paraplegia", not "a paraplegic") ● Adjusts pillows and blanket if needed after examination, and replaces the call button or wheelchair so it is accessible to the patient if moved during patient examination in bed ● Identifies self and makes the patient aware verbally before making physical contact with a patient who is blind ● Helps adjust clothing to maximize modesty during the exam
Level 3 *Proactively maintains patients' comfort and dignity during history taking and physical examination for those with mild impairments or disabilities*	● Takes care to avoid causing discomfort to the patient while testing active range of motion of an inflamed knee joint ● Approaches a patient with a right visual field defect from the patient's left (intact) side as not startle the patient
Level 4 *Proactively maintains patients' comfort and dignity during history taking and physical examination for those with severe impairments or disabilities*	● Turns a patient with dense hemiplegia with ease during physical examination without pulling on the weak arm, keeps the weak arm supported at all times during the turn, and appropriately uses techniques such as bending the opposite knee or crossing the patient's ankles in the direction of the turn to facilitate the movement; controls any spasms provoked by the movement by exerting gentle pressure on the spastic limb
Level 5 *Serves as a role model and as a resource for others by coaching them in behaviors and actions that optimize the comfort, dignity, and respect of people with impairments or disabilities*	● Is recognized as a role model for demonstrating disability etiquette in clinical interactions and selected to teach a workshop on optimal techniques to examine patients with different disabling conditions
Assessment Models or Tools	● Direct observation ● Global evaluation ● Mentor and program director observations ● Multisource feedback ● Oral or written self-reflection ● Simulation

Curriculum Mapping	●
Notes or Resources	● Sabharwal S. Assessment of competency in positioning and movement of physically disabled patients. *Acad Med*. 2000;75(5):525. https://journals.lww.com/academicmedicine/Fulltext/2000/05000/Assessment_of_Competency_in_Positioning_and.47.aspx. 2021. ● Sabharwal S. Objective assessment and structured teaching of disability etiquette. *Acad Med*. 2001;76(5):509. https://journals.lww.com/academicmedicine/Fulltext/2001/05000/Objective_Assessment_and_Structured_Teaching_of.38.aspx#pdf-link. 2021. ● United Spinal Association. *Disability Etiquette: Tips on Interacting with People with Disabilities.* New York, NY: United Spinal Association; 2019. https://www.unitedspinal.org/pdf/DisabilityEtiquette.pdf. 2021.

Interpersonal and Communication Skills 1: Patient- and Family-Centered Communication	
Overall Intent: To deliberately use language and behaviors to form constructive relationships with patients, to identify communication barriers including self-reflection on personal biases, and minimize them in the doctor-patient relationships; organize and lead communication around shared decision making	
Milestones	**Examples**
Level 1 *Uses language and non-verbal behavior to demonstrate respect and establish rapport* *Identifies common barriers to effective communication while accurately communicating own role within the health care system*	● Self-monitors and controls tone, non-verbal responses, and language and asks questions to invite patient/family participation ● Accurately communicates their role in the health care system to patients/families ● Readily uses a certified medical interpreter ● Avoids medical jargon when talking to patients, meets families where they are and communicates with appropriate level of understanding ● Recognizes the role of implicit bias during interactions with patients and families
Level 2 *Establishes a therapeutic relationship in straightforward encounters using active listening and clear language* *Identifies complex barriers to effective communication*	● Uses active listening, attention to affect, and questions that optimally explore the active issues and context when speaking with patients and families ● Identifies complex communication barriers such as a family that is unable to read the instructions for medication titration
Level 3 *Establishes a therapeutic relationship in challenging patient encounters* *When prompted, reflects on personal biases while attempting to minimize communication barriers*	● Establishes and maintains a therapeutic relationship by discussing medical management with a patient adamantly opposed to medication ● With guidance, recognizes personal bias to natural remedies
Level 4 *Easily establishes therapeutic relationships, with attention to patient's/patient's family's concerns and context, regardless of complexity* *Independently recognizes personal biases while attempting to proactively minimize communication barriers*	● Establishes a therapeutic relationship with divorced parents who have differing opinions on the patient's care ● Repeats an implicit bias test after working to address previously identified biases ● Attends workshops on implicit bias to gain insight into behaviors
Level 5 *Mentors others in situational awareness and critical self-reflection to consistently develop positive therapeutic relationships*	Leads discussions on self-reflection and how it can improve care ● Is an example to others of leading shared decision making with clear recommendations to patients and families even in more complex clinical situations

Role models self-awareness practice while identifying teaching a contextual approach to minimize communication barriers	
Assessment Models or Tools	● Direct observation ● Multisource feedback ● Self-assessment including self-reflection exercises ● Standardized patients or 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.researchgate.net/publication/49706184_Communication_skills_An_essential_component_of_medical_curricula_Part_I_Assessment_of_clinical_communication_AMEE_Guide_No_511. 2021. ● Makoul G. Essential elements of communication in medical encounters: The Kalamazoo consensus statement. *Acad Med*. 2001;76(4):390-393. https://www.researchgate.net/publication/264544600_Essential_elements_of_communication_in_medical_encounters_The_Kalamazoo_Consensus_Statement. 2021. ● Makoul G. The SEGUE Framework for teaching and assessing communication skills. *Patient Educ Couns*. 2001;45(1):23-34. https://www.researchgate.net/publication/11748796_The_SEGUE_Framework_for_teaching_and_assessing_communication_skills. 2021. ● Symons AB, Swanson A, McGuigan D, Orrange S, Akl EA. A tool for self-assessment of communication skills and professionalism in residents. *BMC Med Educ*. 2009;9:1. https://bmcmededuc.biomedcentral.com/articles/10.1186/1472-6920-9-1. 2021.

Interpersonal and Communication Skills 2: 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 each patient's/patient's family's expectations and understanding of their health status and treatment options*	● Recognizes that the patient should understand their diagnosis of epilepsy and the importance of taking their medication to prevent seizures ● Knows when to provide information to families in their native language about seizures to better inform them about their child's epilepsy
Level 2 *Describes methods for effective patient and patient family education* *Organizes and initiates communication with patients and their families by introducing stakeholders, setting the agenda, clarifying expectations, and verifying understanding of the clinical situation*	● Tells a more junior resident how to access an appropriate seizure action plan ● 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 and their families 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 and relevant family education which families find helpful and understandable ● For a patient with cerebral palsy, educates the family about what is known and the limits of treatment saying, "I don't know" when that is the case and follows up appropriately ● Compassionately conveys education in a conversational manner without lecturing, and continually checks in (verbally or non-verbally) to confirm patient and families' understanding
Level 4 *Educates patients and their families effectively in complex situations* *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 neuronal ceroid lipofuscinosis, educates the family about what is known and the limits of treatment saying, "I don't know" when that is the case and follows up appropriately ● Elicits family preferences and formulates an appropriate treatment plan taking these preferences into consideration

Level 5 *Educates patients and their families in self-advocacy, community outreach, and activism*	● Goes to local schools to educate students and staff members about epilepsy and seizure first aid
Models shared decision making in patient/family communication, including those with a high degree of uncertainty/conflict	● The resident is seen as a positive role model for effective communication during an interdisciplinary family meeting
Assessment Models or Tools	● Direct observation ● Multisource feedback ● Self-assessment ● Self-reflection ● Standardized patients or 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. 2021. ● Lindeman, CA. Patient education. *Annu Rev Nur Res*. 1988;6:29-60. https://pubmed.ncbi.nlm.nih.gov/3291915/. 2021. ● 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. 2021. ● Vital Talks

Interpersonal and Communication Skills 3: 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	● Listens to and considers others' points of view, is nonjudgmental and actively engaged, and demonstrates humility
Level 2 *Clearly and concisely requests or responds to a consultation*	● Communicates back to referring provider the specific recommendations after performing a consult
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, actively showing verbal and non-verbal signs (eye contact, posture, reflection, questioning, summarization)
Communicates concerns and provides feedback to peers and learners	● Respectfully and regularly provides feedback to junior members of the medical team for the purposes of improvement or reinforcement of correct knowledge, skills, and attitudes
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
Communicates feedback and constructive criticism to superiors	● Offers suggestions to negotiate or resolve conflicts among health care team members; raises concerns or provides opinions and feedback, when needed, to superiors on the team

Level 5 *Models flexible communication strategies that value input from all health care team members, resolving conflict when needed* *Facilitates regular health care team-based feedback in complex situations*	● The resident is seen as a positive role model by the junior residents for resolving conflict within the health care team ● Organizes a team meeting to discuss and resolve potentially conflicting points of view on a plan of care (e.g., therapeutic apheresis for rare neurological condition, use of rare resources)
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Multisource feedback ● Self-reflection ● 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. 2021. ● Dehon E, Simpson K, Fowler D, Jones A. Development of the faculty 360. *MedEdPORTAL*. 2015;11:10174. https://www.mededportal.org/publication/10174/. 2019. ● 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/. 2021. ● Green M, Parrott T, Cook G. Improving your communication skills. *BMJ*. 2012;344:e357. https://www.bmj.com/content/344/bmj.e357. 2021. ● Henry SG, Holmboe ES, Frankel RM. Evidence-based competencies for improving communication skills in graduate medical education: a review with suggestions for implementation. *Med Teach*. 2013;35(5):395-403. https://www.tandfonline.com/doi/full/10.3109/0142159X.2013.769677. 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://www.ncbi.nlm.nih.gov/pubmed/10742358. 2021. ● 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. 2021.

Neurodevelopmental Disabilities Supplemental Guide

Interpersonal and Communication Skills 4: 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 smart phrases/prepared scripts in the EHR 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 that may contain extraneous information ● Uses smart phrases/prepared scripts 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 (anticipatory guidance) ● Uses appropriate method of communication to share results needing urgent attention
Level 4 *Communicates clearly, concisely, timely, and in an organized written form, including anticipatory guidance* *Achieves written or verbal communication (e.g., patient notes, email) that serves as an example for others to follow*	● Documentation is accurate, organized, and concise and includes anticipatory guidance ● Others turn to this resident for examples of note template ● Nurses evaluate this resident as having timely notes
Level 5 *Models feedback to improve others' written communication* *Participates in developing departmental or institutional communication around policies and procedures*	● Teaches colleagues how to improve discharge summaries ● 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. 2021. ● Haig KM, Sutton S, Whittington J. SBAR: a shared mental model for improving communication between clinicians. *Jt Comm J Qual Patient Saf.* 2006;32(3)167-175. https://www.ncbi.nlm.nih.gov/pubmed/16617948. 2021. ● Starmer AJ, Spector ND, Srivastava R, et al. I-PASS, a mnemonic to standardize verbal handoffs. *Pediatrics.* 2012;129(2):201-204. https://ipassinstitute.com/wp-content/uploads/2016/06/I-PASS-mnemonic.pdf. 2021.

To help programs transition to the new version of the Milestones, the 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: Neurologic and Developmental History
PC2: Neurological Exam	PC2: Neurodevelopmental Examination PC10: Determination of Death by Neurologic Criteria
PC3: Neurodevelopmental Exam	PC2: Neurodevelopmental Examination
PC4: Management/Treatment	PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting
PC5: Neurodevelopmental Disabilities	PC3: Neurodevelopmental Disabilities PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting
PC6: Neurometabolic and Neurogenic Disorders	PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting
PC7: Movement Disorders	PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting
PC8: Neuromuscular Disorders	PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting MK4: Electromyography
PC9: Cerebrovascular Disorders	PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting
PC10: Cognitive, Behavioral, and Psychiatric Disorders	PC4: Behavioral and Psychiatric Disorders PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting
PC11: Neuroimmunologic and White Matter Disorders	PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting

	PC7: Diagnosis and Management in the Outpatient Setting=
PC12: Epilepsy	PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting
PC13: Headache Syndromes	PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting
PC14: Neuro-Oncology	PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting
PC15: Neuroimaging	MK3: Neuroimaging
PC16: Electroencephalogram (EEG)	PC8: Electroencephalogram (EEG)
PC17: Lumbar Puncture	PC9: Lumbar Puncture
MK1: Formulation	PC5: Critical Care PC6: Diagnosis and Management ion the Inpatient Setting PC7: Diagnosis and Management in the Outpatient Setting
MK2: Development	MK1: Development and Behavior
MK3: Localization	MK2: Localization
MK4: Diagnostic Investigation	MK5: Diagnostic Investigation
SBP1: Community Resources	SBP5: Community Resources
SBP2: Systems thinking, including cost- and risk-effective practice	SBP4: Physician Role in Health Care Systems SBP2: Quality Improvement
SBP3: Work in inter-professional teams to enhance patient safety	SBP1: Patient Safety SBP2: Quality Improvement
	SBP3: System of Care Delivery: Patient- and Family-Centered Care
	SBP6: Diversity and Equity that Impact Neurodevelopmental Access and Outcomes
PBLI1: Self-directed learning	PBLI2: Reflective Practice and Commitment to Personal Growth
PBLI2: Locate, appraise, and assimilate evidence from scientific studies related to the patient's health problems	PBLI1: Evidence-Based in Informed Practice

PROF1: Compassion, integrity, accountability, and respect for self and others	PROF1: Professional Behavior PROF3: Accountability/Conscientiousness
PROF2: Knowledge about, respect for, and adherence to the ethical principles relevant to the practice of medicine	PROF2: Ethical Principles
	PROF4: Well-Being
	PROF5: Patient Care Etiquette with Patients of all Abilities
ICS1: Relationship development, teamwork, and managing conflict	ICS1: Patient- and Family-Centered Communication ICS2: Patient and Family Education ICS3: Interprofessional and Team Communication
ICS2: Information sharing, gathering, and technology	ICS4: 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/