A competency-based longitudinal core curriculum in medical neuroscience

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ABSTRACT

Current medical educational theory encourages the development of competency-based curricula. The Accreditation Council for Graduate Medical Education's 6 core competencies for resident education (medical knowledge, patient care, professionalism, interpersonal and communication skills, practice-based learning, and systems-based practice) have been embraced by medical schools as the building blocks necessary for becoming a competent licensed physician. Many medical schools are therefore changing their educational approach to an integrated model in which students demonstrate incremental acquisition and mastery of all competencies as they progress through medical school. Challenges to medical schools include integration of preclinical and clinical studies as well as development of learning objectives and assessment measures for each competency. The Undergraduate Education Subcommittee (UES) of the American Academy of Neurology (AAN) assembled a group of neuroscience educators to outline a longitudinal competency-based curriculum in medical neuroscience encompassing both preclinical and clinical coursework. In development of this curriculum, the committee reviewed United States Medical Licensing Examination content outlines, Liaison Committee on Medical Education requirements, prior AAN-mandated core curricula for basic neuroscience and clinical neurology, and survey responses from educators in US medical schools. The newly recommended curriculum provides an outline of learning objectives for each of the 6 competencies, listing each learning objective in active terms. Documentation of experiences is emphasized, and assessment measures are suggested to demonstrate adequate achievement in each competency. These guidelines, widely vetted and approved by the UES membership, aspire to be both useful as a stand-alone curriculum and also provide a framework for neuroscience educators who wish to develop a more detailed focus in certain areas of study. ***Neurology*® 2014;83:456–462**

GLOSSARY

AAN = American Academy of Neurology; **LCME** = Liaison Committee on Medical Education; **LP** = lumbar puncture; **NBME** = National Board of Medical Examiners; **OSCE** = objective structured clinical examinations; **UES** = Undergraduate Education Subcommittee; **USMLE** = United States Medical Licensing Examination.

As translational medicine moves to the forefront of medical research and clinical practice, the boundary between basic science and clerkship training in medical schools is beginning to blur. Over the past 5 years, the content of the United States Medical Licensing Examination (USMLE) examinations has been evolving accordingly by increasing the clinical content of the Step 1 examination as well as ensuring foundational material is covered in all 3 Step examinations.[1]

Numerous medical schools have been modifying their curricula in parallel with these developments. In addition, a number of newly accredited allopathic medical schools that embrace this approach have opened in recent years: 16 new schools have been accredited by the Liaison Committee on Medical Education (LCME) since 2007, with another 4 applications pending.[2] In order to assist schools with their curriculum reform and development efforts, the American Academy of Neurology (AAN) assembled a committee of basic and clinical neuroscience educators to establish new guidelines for medical education in the neurosciences.

Supplemental data at Neurology.org

From SUNY Downstate Medical Center and Kings County Hospital (L.R.M.), Brooklyn, NY; University of Arizona (H.A.H.), Tucson; Harvard Medical School and Brigham & Women's Hospital (T.A.M.), Boston, MA; Oregon Health & Science University and Portland VAMC (J.A.K.); and University of Toledo (I.I.A.), OH.

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Medical schools in the United States vary widely in their curriculum design. Some teach fundamental neuroanatomy and neurophysiology in year 1 and abnormal correlations such as neuropathology, pathophysiology, and pharmacology in year 2; others present all of neuroscience in one combined preclinical course; and yet others still teach the basic sciences as independent disciplines without having yet integrated to a systems-based approach. Furthermore, there is interschool variability in the neurology clerkship availability (elective or required), length (3–6 weeks), timing (third vs fourth year, or even second year in schools with a shorter preclinical curriculum), content (pediatric neurology, neurosurgery, psychiatry, ophthalmology, physical medicine), and clinical experience (proportion of outpatient vs inpatient vs emergency room exposure; general vs subspecialty).

Much of the neuroscience and neurology content of a school's curriculum may appear outside the neuroscience-designated coursework. For example, many diseases with neurologic manifestations are cross-disciplinary in nature (e.g., sleep apnea, Wilson disease, hypothyroidism, myotonic dystrophy, inborn errors of metabolism) and may therefore be covered in pulmonary, gastrointestinal, endocrinology, genetics, and pediatrics courses, respectively. Similarly, the basic cellular and molecular underpinnings of neurologic diseases are likely to be taught in fundamental basic science coursework outside of the neuroscience course per se. Therefore, a medical neuroscience curriculum has to be broad enough that it can be used by both traditionally structured medical schools and those using an integrated preclinical/clinical model, yet be specific enough that it has functional utility to all those involved in medical education, regardless of which course they teach.

Availability of a longitudinal core curriculum can help ensure that every medical student receives a strong foundation in clinical neuroscience. In the United States, primary neurologic diseases and complaints account for approximately 7% of outpatient office visits[3] and over 5% of emergency room visits[4,5]; these numbers are significantly higher when one includes musculoskeletal complaints and neurologic complications of other conditions such as infection, trauma, and metastatic malignancy.[3,4] The aging of the US population has been further increasing the burden of neurodegenerative disorders for the general practitioner.[6,7] Hence our physicians-in-training need to develop a systematic approach to the evaluation and management of neurologic problems, including fundamental localization skills and the ability to recognize emergency conditions. The next generation of physician-scientists will also need a basic neuroscience research education if it is to advance our understanding of the fundamental pathophysiologic underpinnings of nervous system disorders to develop new targets for diagnostic testing and novel therapeutic approaches for neurodegenerative and neurohereditary conditions.[8–10]

Despite the variability in curricular design across US medical schools, all schools must be in compliance with current LCME standards for accreditation. The latest LCME requirements, which will be implemented in 2015, emphasize the learning of competencies rather than facts.[11] With all this in mind, the following competency-based template for medical neuroscience education is provided, merging basic and clinical neuroscience into one core curriculum. The structure of this curriculum is designed to allow flexibility, without dictating when and where the items listed should be taught.

THE COMPETENCY-BASED CURRICULUM In 1999, the Accreditation Council for Graduate Medical Education introduced 6 core competencies as the basis for training and evaluation of residents: medical knowledge, patient care, interpersonal and communication skills, professionalism, practice-based learning and improvement, and systems-based practice.[12] These same competencies have been embraced for the education of medical students, as these comprise the core skill set that students need as they embark on their clinical careers.[13] Implementation of the competencies acknowledges that medical education and training involves much more than mastery of a core knowledge base; rather, competent and qualified physicians need to develop a broader set of skills and attitudes, which will allow them to function effectively in their clinical role and continue to grow throughout their professional career.

The learning objectives delineated within each competency must prepare a student for medical

practice in a world in which a grasp of fundamental neuroscience is becoming increasingly important for the understanding and pursuit of translational breakthroughs. The USMLE had this in mind when developing and revising the examination content in recent years.[1] Therefore, in the development of the new curriculum guidelines (available in full in appendix e-1 on the *Neurology*® Web site at Neurology.org), the following data were carefully reviewed by a workgroup appointed by the AAN Undergraduate Education Subcommittee (UES): the 2012–2013 USMLE content guidelines,[14] the 2008 AAN-endorsed basic neuroscience core curriculum,[15] the 2002 AAN-endorsed neurology clerkship core curriculum,[16] and responses of basic neuroscience and clinical course directors to open-ended survey questions collected by the AAN over the past 3 years. Current LCME requirements for medical school accreditation were also taken into consideration in the development of the updated curriculum presented herein to assist schools in achieving compliance.[17]

The Core Curriculum Workgroup presented its findings to the general UES membership and generated the proposed curriculum. This curriculum was vetted by veteran neuroscience educators as well as the AAN Consortium of Neurology Clerkship Directors. Based on their feedback, this proposal was then reviewed, revised, and approved by the general UES membership.

Under each core competency, a list of achievable goals appears, using active verbs ("Bloom taxonomy"[18,19]), to generate concrete learning objectives so that students better grasp the curricular requirements. However, the learning objectives are expressed in broad terms to allow individual medical schools to adapt and expand these guidelines to fit their personal needs. Course directors are advised to use this as an outline and develop expanded learning objectives as needed, depending on the precise content of one's course.

Some of the listed subject matter is likely to be taught outside the neuroscience and neurology courses of a given medical school. Neuroscience educators, both basic and clinical, will be invaluable in the development of the curricula for these cross-disciplinary sessions. Involvement of the neuroscience faculty will ensure appropriate coverage of the necessary material and eliminate unintended redundancies.

DOCUMENTATION OF CLINICAL EXPERIENCES: CASE LOGS AND PORTFOLIOS At present, the LCME does not require medical schools to provide a formal structured neurology clerkship, but it does state that each school's curriculum "must cover *all* organ systems, and include important aspects of preventive, acute, chronic, continuing, rehabilitative, and end-of-life care" (ED-13).[17] Thus it would be advisable for schools to have their students maintain a record of their clinical encounters with neurologic patients as evidence of meeting this requirement. Portfolios are one means by which students can record and reflect upon their clinical experiences and training.[20] For administrative purposes, however, case logs are a convenient way to monitor student progress and assure that each student has encountered a predetermined minimum number of patients in each required category (as required by LCME ED-2).[17] Table 1 is provided as an example of how this requirement can be fulfilled. For schools with a neurology clerkship, this log would be completed over the duration of the rotation. For schools without a neurology clerkship, the student can be allowed to complete the log gradually across their clinical training on other required rotations such as medicine, pediatrics, and family medicine. The broad categorical organization of table 1 provides a foundation for development of integrative skills by which students can compare and contrast similar findings across disease processes seen in various settings and courses. All students at all sites in all schools should have no difficulty meeting these suggested requirements.

Case logs are also useful for documenting the performance of procedures. Neurology is not a procedure-based specialty; nonetheless, lumbar puncture (LP) is the one technique that should be learned during medical school and is most relevant to the practice of neurology. Not every medical student will necessarily get the opportunity to perform a LP. The LP training requirement may be completed by watching a resident or fellow perform one, by training on a simulator,[21] or at minimum, by viewing a training video.[22]

ASSESSMENT TOOLS FOR THE 6 COMPETENCIES: OUTCOME OBJECTIVES AND ACHIEVABLE GOALS There are a number of recommended ways in which we should assess the progress of our students and the attainment of the skills needed to proceed as certified licensed physicians. Historically the focus of assessments has been on medical knowledge. With the introduction of the competency-based curriculum, there is now a need to expand our assessment methods in a formal manner.

Medical knowledge. The National Board of Medical Examiners (NBME) provides a pool of multiple-choice questions that can be utilized to administer final examinations in the preclinical years and they also provide clinical neurology "shelf" examinations for clerkship students. These examinations are extremely useful, especially in the clinical years, as they provide the students with a percentile performance to gauge their knowledge relative to their counterparts at other schools at the same level of training. The NBME does not determine the

Table 1 Suggested minimum clinical encounter requirements (10 total)

Neurologic disturbance	Experience type (live vs simulated)	Minimum no. of encounters; role required (participated vs observed)
Transient neurologic disturbance. Examples: TIA, syncope, seizures, sleep disorders, movement disorders, dizziness, vertigo, migraine	Live	2; participated
Cognitive disturbance, acute or chronic. Examples: developmental disability, dyslexia, aphasia, apraxia, agnosia, visuospatial dysfunction, acalculia, dementia, altered mental status, brain death	Live	1; participated
Focal or diffuse motor disturbance, acute or chronic. Examples: weakness, clumsiness, gait disturbance, diplopia, dysphagia, dysarthria, urinary or bowel incontinence, movement disorder	Live	2; participated
Acute or chronic pain. Examples: headache, facial pain, neck pain, back pain, neuropathic pain, thalamic pain	Live	1; participated
Sensory disturbance (loss or paresthesia). Examples: peripheral neuropathy, radiculopathy, peripheral nerve trauma (carpal tunnel, gunshot wound), central causes of sensory disturbance (e.g., demyelination, tumor, arteriovenous malformation, in brain or spinal cord)	Live	2; participated
Neurologic emergencies	Live or simulated	2; participated
Acute stroke (ischemic or hemorrhagic)		
Status epilepticus (convulsive or nonconvulsive); peripartum seizures		
Depressed consciousness, stupor or coma		
Spinal cord or cauda equina compression		
Delirium/encephalopathy/delirium tremens		
CNS infections		
Acute head trauma		
Spontaneous subarachnoid hemorrhage		
Increased intracranial pressure		
Neuromuscular emergencies (Guillain-Barré, myasthenic crisis)		
Sudden vision loss		
Neuroleptic malignant syndrome		

cutoff for passing its clinical neurology subject examination or its preclinical neuroscience examination; it is left to the individual course directors to use the examinations as they see fit. We suggest that all course directors select a definitive minimum competence requirement for shelf performance upon completion of their rotation. We also suggest incorporation of laboratory practicals, essay questions, and short-answer write-ins, especially in the preclinical years, so that students get accustomed to having to express themselves coherently and generate answers without seeing a list of possible answers; these skills will be critical for the assessment of patients in the clinical years.

Patient care. All students should be credentialed by neurologists or neurology residents in the competent performance of the bedside neurologic assessment, including taking a history and performing a neurologic examination. Improving efficiency in patient evaluation should be demonstrated over the 4 years, with the students honing their skill in performing an increasingly focused assessment by the time they graduate. There should also be objective structured clinical examinations (OSCE)[23] of increasing difficulty during the preclinical and clinical years, especially covering neurologic emergencies. Other potential modes for evaluation of clinical skills include patient simulations (live standardized patients,[24] simulation centers,[25] interactive computerized sessions, or traditional vignettes can all serve this purpose) and localization exercises (again, varying difficulty for preclinical vs clinical year students). Students should hone their skill in interpretation of patient data when required to present patients to their preceptors on rounds; oral final examinations are a useful means by which to ensure each student has mastered this skill.

Interpersonal and communication skills. Students should be observed interacting with patients and their families on ward rounds with the resident and attending teams or in the clinic setting. In this context, 360-degree evaluations are useful: feedback should be obtained from all individuals who interact with the medical trainee. Sources of such feedback include not only peers, residents, allied health professionals, and other members of the health care team, but importantly, the patients and their families as well.[26,27] Portfolios and reflective essays can aid students in developing their ability to deal with ethical issues related to genetic testing as well as counseling patients regarding end-of-life care and brain death. OSCE questions can be designed to address some of these areas. Communication skills may also be assessed formally during teaching rounds (when students make patient presentations) and via a summative oral examination as detailed above.

Practice-based learning. Patient write-ups provide the ideal opportunity for students to quote from the latest references information that is specifically relevant to their patient, thereby demonstrating their ability to apply principles of lifelong learning and practice of evidence-based medicine. During clinical rotations, students should be prepared to quote current references when presenting patients on rounds.

Systems-based practice. This is ideally assessed in the clinical years, and can be observed on the wards and

Table 2 Assessment measures for competency-based milestones (Gateways)

	Gateway 1: Preclinical/foundational	Gateway 2: Early clinical/clerkship year	Gateway 3: Advanced clinical
Medical knowledge (MK)	MK1–12: MCQ (NBME, TBL scores, or other), essays, small group evaluations, lab practicals, oral examinations	MK3 (stroke code), MK5 (focus on diagnostic testing), MK6, MK7, MK9, MK12: MCQ, essay, oral examination, OSCE/SP, NEX	MK3, MK6, MK8: MCQ, essay, OSCE/SP, NEX, oral examination, clinical evaluations, CPC presentations and discussions
Patient care (PC)	PC1, PC4, PC5, PC7: Competence in performing complete normal neurologic examination—OSCE/SP, write-ups, small group evaluations (CBL facilitator or other), CS preceptor evaluation, MCQ based on vignettes and videos	PC2–10: Competence in eliciting abnormal findings on performance of neurologic examination—MCQ, OSCE/SP, patient write-ups, oral examination, portfolio/case logs, clinical evaluations; lumbar puncture skill	PC2, PC3, PC4, PC8, PC9: Competence in performing efficient focused neurologic examination (OSCE/SP/NEX); essay, oral examination, portfolio, CPC presentations and discussions
Interpersonal and communication skills (ICS)	ICS1: OSCE on obtaining history; ICS2: CBL evaluation, CS preceptor evaluation; ICS3: role play or OSCE, CBL facilitator and CS preceptor evaluation	ICS1: Organized and coherent presentation, OSCE; ICS2 and 3: supervised patient encounter with low-risk, low-stakes discussion, essay, clinical evaluations, 360° evaluation; ICS4: OSCE, essay, clinical evaluation	ICS1: Summarizes pertinent positive and negative findings—OSCE/NEX; ICS2 and 3: higher stakes discussion—OSCE, NEX, essay, clinical evaluations, 360° evaluation; ICS4: OSCE, essay, clinical evaluation
Practice-based learning and improvement (PBLI)	PBLI1: Reflective essay; CBL evaluations	PBLI1: Clinical evaluations; PBLI2: clinical evaluations, reflective essay	PBLI1: Clinical evaluations; PBLI2: clinical evaluations, reflective essay
Systems-based practice (SBP)	SBP2: MCQ, reflective essay, small group evaluations	SBP1 and 2: Reflective essay, small group evaluation, portfolio, 360° evaluation, clinical evaluations	SBP1 and 2: Reflective essay, small group evaluation, portfolio, 360° evaluation, clinical evaluations
Professionalism (P)	P1 and 2: Reflective essay, small group evaluations, MCQ	P1–4: MCQ, reflective essay, small group evaluations, 360° evaluation	P1–4: MCQ, reflective essay, small group evaluations, 360° evaluation

Abbreviations: CBL = case-based learning (small group teaching session); CPC = clinical-pathologic case conference; CS = clinical skills; MCQ = multiple choice questions; NBME = National Board of Medical Examiners; NEX = neurology evaluation exercise (clinical skills examination); OSCE = objective structured clinical examination; SP = standardized patient; TBL = team-based learning.

discussed on rounds. As for most competencies, an OSCE or essay question can be designed to assess mastery more directly if desired.

Professionalism. This is a fundamental aspect of being a medical professional; responsible and ethical behavior should be expected and monitored across all activities throughout medical school. The 360-degree evaluation is very useful here as well.

The assessment modalities in almost all cases need to be of incremental difficulty when used across years to gauge progression of the student's mastery of the competency as deemed appropriate for level of training. The Miller medical education construct provides one example of such an approach in the assessment of clinical skills: a student first acquires knowledge ("knows"), and the traditional multiple-choice examination will assess this mastery of knowledge. The student must next demonstrate that he or she "knows how" (demonstrates competence), "shows" (performs in a clinical context), and "does" (action taken when functioning independently).[28] Table 2 is provided as one example of how the learning objectives of our core curriculum may be evaluated in this developmental manner as the student advances through undergraduate medical training. All faculty who administer and grade these various assessments need to be trained to provide cross-examiner consistency and validity of scores.[29]

OVERCOMING CHALLENGES TO ADOPTION AND IMPLEMENTATION OF THE COMPETENCY-BASED CURRICULUM Implementation of a competency-based longitudinal curriculum requires a team approach, with strong commitment and collaboration between basic and clinical neuroscience faculty. The leadership of a medical school needs to support the endeavor as well in order for it to succeed. However, even in the face of leadership that is resistant to changing the overall design of the medical school's curriculum or the amount of time devoted to neuroscience-relevant coursework, there are a number of ways in which neuroscience educators can ensure that the students get the education they need and the school's medical neuroscience curriculum is in compliance with LCME guidelines:

1. Set up a committee of basic and clinical neuroscience faculty involved in medical student education across the 4 years, and hold regular meetings in which the membership can discuss issues of mutual concern. This will open lines of communication, ensuring that all are aware of the longitudinal neuroscience curricular content of their medical school, allowing the membership to reduce redundancies and fill in any gaps that may be brought to their attention either via their discussions or via reference to the new competency-based core curriculum.
2. Regularly post neurology mystery cases on your Web site, or post links to interesting neuroscience-relevant

articles in the news. This approach allows students to gain additional exposure to neurology and neuroscience beyond the school's mandated curriculum, as it need not abide by the confines and time constraints of the students' required coursework.

3. Make various neuroscience-relevant electives available to the medical students. If your local department cannot accommodate this, find outside institutions and hospitals that can provide suitable elective rotations in basic or clinical neuroscience and have this list conveniently accessible to the students.
4. Encourage the medical students to participate in their local AAN-sponsored Student Interest Group in Neurology/Neuroscience (SIGN) club. Suggest invited speakers to cover subjects that may be otherwise relatively neglected in the curriculum such as recent research advances in the neurosciences.

The AAN UES hopes that these guidelines aid medical educators across the nation to ensure that all students graduate from medical school adequately prepared for the neurologic challenges that will face them in residency training, clinical practice, and beyond.

AUTHOR CONTRIBUTIONS

L.R.M. chaired the UES Core Curriculum Workgroup, which was responsible for the creation of the new core curriculum; she collected and analyzed all relevant data and was responsible for preparation of the manuscript. H.A.H. worked closely with L.R.M. in development of the core curriculum guidelines and worked on revision of the manuscript. T.A.M. chaired the UES ED-2 Workgroup, which was responsible for development of table 1. J.A.K. was responsible for development of table 2. I.I.A. chaired the UES and provided guidance to the other authors with their respective assignments. All authors edited earlier versions of the curriculum and the manuscript.

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THE COMPETENCY-BASED LONGITUDINAL CORE CURRICULUM IN MEDICAL NEUROSCIENCE

A. Medical Knowledge

MK1. Describe the normal development of the nervous system, and list the various disorders of neuronal development and fetal maturation that can occur (leukodystrophies, heterotopias, congenital malformations of skull & brain or spine & spinal cord).

MK2. Describe mechanisms of remodeling of the nervous system during development and following neural injury.

MK3. Describe contribution of somatic and mitochondrial genetic disorders to major neurologic diseases, including triplet repeat expansions; describe epigenetic mechanisms that contribute to neurologic diseases.

MK4. Recognize clinical impact of disordered cerebral homeostasis (CSF, blood-brain barrier, brain metabolism).

MK5. Distinguish normal cellular elements of the nervous system from tumor pathology based on histologic features.

MK6. Describe various aspects of molecular and cell biology of neural tissue as they pertain to the underlying pathophysiology of nervous system diseases and the mechanism of action of neurotherapeutic agents.

MK7. Localize neurologic deficits to the most likely sites in the central and/or peripheral nervous system based on mastery of functional neuroanatomy (function of structures, tracts, and nuclei in brain and spinal cord; vascular territories; cranial nerves and skull foramina; spinal roots, plexi, nerves, and muscles; autonomic and enteric nervous systems).

MK8. Identify major nervous system diseases based on gross and microscopic pathology, clinical features, and/or associated CSF findings, comparing and contrasting each of these with their normal counterparts.

MK9. Describe pathophysiology of major diseases resulting from aberrant central and peripheral neurophysiological function (e.g. stupor and coma, epilepsy, movement disorders, sleep disorders, demyelinating diseases, disordered neuromuscular transmission, muscle diseases, channelopathies, neuropathies); explain how EEG, EMG, nerve conduction studies and/or repetitive stimulation studies can aid in diagnosis based on underlying mechanisms of these disturbances.

MK10. Identify neural mechanisms (anatomy, physiology and pharmacology) of attention, consciousness, sleep, emotion, memory, language, praxis, visuospatial function, and other higher cortical functions; describe clinical disturbances related to each.

MK11. Describe clinical features of disturbances in neuroendocrinology and neuroimmunology; explain underlying pathophysiology of these clinical presentations.

MK12. Describe mechanisms of action of neuropharmacological agents, both therapeutic and toxic, that act at CNS, PNS, or ANS; list their indications, contraindications, and major side effects. Be familiar with non-pharmacologic and complementary medicine approaches to treatment of major neurologic disorders.

B. Patient Care:

PC1. Demonstrate competence in the bedside clinical assessment of the nervous system by obtaining a relevant history and performing a complete

neurological examination, including special maneuvers as indicated (meningeal signs, Dix-Hallpike, straight leg raising).

PC2. Delineate the steps one would take to evaluate patients with common neurologic symptoms (e.g. dizziness, visual disturbance, numbness, weakness, balance problem, headache). Specify aspects of history, physical findings, and workup that would help localize and distinguish among diagnostic possibilities.

PC3. Localize symptoms and signs obtained above appropriately and generate a differential diagnosis based on both likelihood and potential treatability of the condition, and thereby determine the appropriate workup and initial management for the patient (bloodwork, CSF, radiologic, and/or electrophysiologic).

PC4. Interpret workup results to determine most likely diagnosis for major, common, or most treatable neurologic diseases. The "major categories" include: infectious, inflammatory and immunologic; traumatic and mechanical; neoplastic; toxic, metabolic, nutritional and regulatory; vascular; congenital/developmental; degenerative; paroxysmal (including pain syndromes); psychopathologic; sleep disorders; and disorders of consciousness.

PC5. List the diagnostic criteria for major neurologic diseases or conditions (e.g. dementia, Parkinson's disease, multiple sclerosis, epilepsy).

PC6. Using pathophysiologic and epidemiologic knowledge of common neurological diseases or conditions, appropriately outline an evidence-based initial treatment plan which takes into account cultural factors and context.

PC7. Diagnose common disorders affecting the special senses (hearing, vision).

PC8. Identify neurologic emergencies by bedside assessment (history and physical exam) and initiate emergency workup and management (such as immediate referral to ER, immediate consultation with neurologist, ophthalmologist and/or neurosurgeon; radiologic studies, laboratory studies, lumbar puncture, pulmonary function tests/vital capacity; immediate admission to critical care setting).

PC9. Participate as a contributing member of the clinical neurology team in all settings (inpatient, outpatient, and emergency room); participate in the evaluation and care of a minimum number and variety of neurologic patients.

PC10. Describe anatomy of spinal cord within spinal canal and proper technique used to perform lumbar puncture safely; list indications and contraindications for LP.

C. Interpersonal and Communication Skills

ICS1. Present patient data, orally and in writing, in an organized coherent concise fashion, summarizing the pertinent positive and negative features of the history and physical exam to support the concluding localization and differential diagnosis.

ICS2. Interact with patients, colleagues, and staff in a respectful, empathic, and constructive manner.

ICS3. Communicate effectively with patients and their families regarding diagnosis, workup and treatment (this includes informed consent for LP as well as ethical issues such as genetic testing, end-of-life care, brain death and organ donation)

ICS4. Communicate effectively with team members to exchange information for patient care.

D. Practice-Based Learning and Improvement

PBLI1. Utilize current resources (journals and appropriate websites) to keep abreast of recent developments that may assist in the workup and management of patients, or may broaden understanding of the pathophysiologic underpinnings of their disease processes.

PBLI2. Demonstrate willingness and ability to learn from mistakes.

E. Systems-Based Practice

SBP1. Interact with consultants and allied health professionals (physician extenders, social workers) as indicated to benefit patient care and to ensure patient safety within the hospital as well as in the home setting.

SBP2. Recognize impact of financial, ethnic, linguistic, organizational, and other social factors on patient care both locally and globally.

F. Professionalism

P1. Attend to duties responsibly, promptly, and ethically; complete all course requirements in a timely fashion.

P2. Demonstrate honesty and integrity in all interactions with peers, faculty, and staff.

P3. Exhibit respectful, responsible, and ethical behavior toward patients and their families.

P4. Exhibit compassionate treatment of patients and respect for their privacy and dignity.