SLEEP MEDICINE CURRICULUM FOR NEUROLOGY RESIDENTS

AMERICAN ACADEMY OF NEUROLOGY®

This curriculum, developed in collaboration with the AAN Consortium of Neurology Program Directors and Graduate Education Subcommittee, provides a comprehensive outline of the relevant educational goals for the future generation of adult neurologists learning sleep medicine during residency. The clinical scope of this curriculum is common and uncommon sleep disorders encountered in typical neurology practices. While the all-encompassing scope of this outline covers more than is expected to be learned by neurology residents on a given subspecialty rotation, the measurable objectives are included to provide program directors and other rotation developers the means of evaluating whether a minimum competence in sleep was attained in any combination of specific areas. Finally, as sleep medicine is a cross-disciplinary neurologic subspecialty, the curriculum ends with a table highlighting overlapping conditions between major sleep disorder categories and neurologic subspecialities.

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Part I. General Clinical Approach

Clinical evaluation:

History

Efficiently obtains a complete, relevant, and organized neurologic history

- Performs comprehensive review of systems pertinent to ICSD-3 sleep-wake disorder categories (sleep-related disordered breathing, hypersomnias, insomnias, parasomnias, sleep-related movement disorders, circadian disorders)
- Performs comprehensive review of systems probing medical conditions that are known to impact sleep-wake disorders (e.g., cardiovascular, pulmonary, rheumatologic, renal, psychiatric, etc.)
- Obtains social history relevant to sleep-wake disorders (e.g., substance/medication use, education/work schedule, etc.)
- Obtains family history as it pertains to sleep-wake disorders with known heritability
- Obtains exposure information where appropriate (e.g., H1N1 influenza or immunization, S. pyogenes, head trauma)

Measurable objective:

1. Has developed at least a set of sleep-related screening questions to add to the review of systems (compare to the AAN-provided pre-visit questionnaire for sleep: https://www.aan.com/practice/electronic-health-records/ehr-templates/)

General physical examination

Efficiently performs a relevant general physical exam accurately incorporating all additional appropriate maneuvers

- Performs integumentary examination (hair, skin, nails)
- Performs comprehensive examination of nasal and oral cavities
- Performs thorough cardiopulmonary examination
- Performs brief mental status examination, as appropriate

Measurable objective:

1. Can properly grade Mallampati, Friedman score, tonsils, and inferior turbinates
2. Can properly perform orthostatic vital signs
3. Can identify signs of decompensated heart failure (left: wet rales; right: JVD distention, pedal edema)
4. Can identify signs of decompensated pulmonary disease (breathlessness, tripodding, crackles/consolidation)
5. Can assess psychiatric risk (suicidality, substance abuse)

Neurologic exam

Efficiently performs a relevant neurologic exam accurately incorporating all additional appropriate maneuvers

- Performs fundoscopy
- Performs movement disorder evaluation to assess for early signs of neurodegeneration
- Performs appropriate screening neurocognitive exam, using validate measures, where appropriate

Measurable objective:

1. Can assess for IIH, when concern arises (e.g., AM headache in obese patients): fundoscopy, peripheral vision, CN VI
2. Can do fundamental movement disorder assessment (e.g., tone, rapid-alternating movements, gait, postural stability) in patient reporting RBD
3. Can choose appropriate cognitive screening measure in the setting of memory concerns (e.g., Mini-Cog, MoCA, MMSE)

Clinical scales

- Demonstrates familiarity with, maintains access to, and utilizes clinical scales where appropriate

Screening:

- Sleep disorders symptom checklist-25
- Mayo sleep questionnaire
- AAN's pre-visit questionnaire

Symptom-specific:

- Performs Epworth sleepiness scale (ESS) or pediatric sleep questionnaire (PSQ) routinely
- Performs sleep-disordered breathing screening questionnaires (e.g., STOP-Bang, Berlin)
- Performs International RLS Study Group (IRLSSG) scale assessment and assesses Clinical/Patient Global Impressions
- Insomnia severity index (ISI)
- Horne-Ostberg Morningness-Eveningness Questionnaire (MEQ)
- Performs MMSE, as appropriate
- Performs MoCA, as appropriate

Measurable objective:

1. Can choose appropriate assessment scale, based on suspected sleep disorder
2. Can choose appropriate assessment scale, based on need to screen or monitor

Diagnostic evaluation:

Neurophysiology

Interprets common polysomnographic, home sleep testing, multiple sleep latency testing, maintenance of wakefulness testing, PAP titration, and EEG

- Can appropriately determine when to order a home sleep test vs full polysomnogram
- Can appropriately determine when to order MSLT and MWT in the evaluation of disorders of sleep and wake
- Demonstrates familiarity with EEG patterns characteristic of each of the primary sleep stages - N1, N2, N3, and REMS—as well patterns suggestive of pathology—epileptiform discharges, electrographic/convulsive seizures, etc.
- Can interpret reported results of MSLT and MWT in the context of diagnosing and treating sleep-wake disorders
- Demonstrates familiarity with the scoring of common sleep breathing disturbances—obstructive apnea, obstructive hypopnea, central apnea—as well as their resolution on treatment studies

- Can identify other clinically-relevant features of sleep disorders: periodic limb movements, loss of REMS atonia, bruxism
- Can appropriately identify common ECG abnormalities: PVCs, PACs, heart block, AV-conduction abnormalities, arrhythmias

Measurable objective:

1. Can differentiate between obstructive and central apneas on PSG
2. Can differentiate between apneas and hypopneas on HST/PSG
3. Can identify stage of sleep when presented with 10- or 30-second epochs containing EEG, EOG, and EMG
4. Can correctly identify arrhythmias on ECG: atrial fibrillation, ventricular fibrillation, ventricular tachycardia

Actigraphy and sleep diaries

Interprets actigraphy and sleep diary data

- Appropriately understands how to differentiate between normal and abnormal sleep patterns from actigraphy reports (summary statistics and actigraphic printout)
- Appropriately interprets and makes clinical decisions based on sleep diary reports

Measurable objective:

1. Can develop personal schedule to shift for call/night-float
2. Can collect and interpret sleep diaries (particularly as relates to neurologic disorders such as headache)

Imaging

Interprets MR neuroimaging of brain

- Recognizes indications for advanced imaging and other diagnostic studies, with a focus on neuroanatomy of interest (hypothalamus, thalamus, brainstem)
- Recognizes MRI findings specific to hypersomnia disorders with additional, focal neurological findings

Measurable objective:

1. Can detail the limited circumstances necessitating MR neuroimaging (e.g., focal neurologic deficits)

Cerebrospinal fluid

Performs lumbar puncture without direct supervision

Accurately interprets results of less common diagnostic testing

- Describes the composition, formation, and fluid dynamics of the CSF
- Recognizes CSF patterns in neuro-infectious and neuroimmune syndromes
- Appropriately interprets CSF hypocretin/orexin levels

Measurable objective:

1. Can identify the diagnostic cut-points for CSF hypocretin values

Additional diagnostic testing

Accurately interprets results of common diagnostic testing

- Appropriately orders and interprets pulmonary function testing and arterial blood gas results, where appropriate
- Appropriately orders and interprets echocardiography, where appropriate
- Appropriately orders and interprets iron studies (total iron, TIBC, and ferritin)
- Appropriately orders salivary/urinary melatonin profiling, when necessary
- Appropriately orders and interprets HLA typing for narcolepsy investigation

Measurable objective:

1. Can interpret the results of HLA genotyping in the work-up of narcolepsy
2. Can define a ferritin target in the treatment of RLS

Treatment strategies and side effects:

Demonstrates sophisticated knowledge of treatment subtleties and controversies in the management of sleep-wake disorders

Employs appropriate prescribing, prescription contract, and substance abuse/diversion monitoring

Cognitive behavioral therapy for insomnia (CBTi)

- Is aware of the principles of CBTi and appropriately refers chronic insomnia patients to CBTi as a first line therapy.

Measurable objective:

1. Can identify the three treatments in the AASM Practice Guidelines with a "Standard" level of recommendation in the treatment of insomnia: stimulus control, relaxation training, and CBT

Sedatives/hypnotics

- Uses sedatives/hypnotics appropriately for acute and chronic insomnia patients
- Demonstrates familiarity with sedative/hypnotic medications, appropriate indications, and their neurologic side effects (e.g., benzodiazepines, benzodiazepine receptor agonist "Z-drugs", doxepin, suvorexant, etc.)

Measurable objective:

1. Can choose an appropriate first-line sedative/hypnotic, based on patient's risk profile

Stimulants

Demonstrates familiarity with stimulant medications, appropriate indications, and their neurologic side effects (e.g., ar/modafinil, amphetamine salts, pitolisant, solriamfetol, etc.)

Measurable objective:

1. Can choose an appropriate first-line stimulant, based on patient's risk profile

Anti-cataplectic therapies

Demonstrates familiarity with anti-cataplectic medications, appropriate indications, and their neurologic side effects (e.g., sodium oxybate/γ-hydroxybutyrate, SNRIs, pitolisant, etc.)

Measurable objective:

1. Can choose an appropriate first-line anti-cataplectic, based on patient's risk profile

Parasomnia therapies

Demonstrates familiarity with available treatments for NREMS and REMS parasomnias

Measurable objective:

1. Can choose an appropriate first-line medication, based on patient's risk profile

Restless leg syndrome therapies

- Demonstrates familiarity with available oral and parenteral iron replacement strategies, as well as appropriate indications and monitoring
- Demonstrates familiarity with α2δ-ligand medications, appropriate indications, and their neurologic side effects (e.g., gabapentin, pregabalin, gabapentin enacarbil, etc.)
- Demonstrates familiarity with dopamine agonist medications, appropriate indications, and their neurologic side effects (e.g., pramipexole, ropinirole, rotigotine patch, etc.)
- Demonstrates familiarity with narcotic medications, appropriate indications, and their neurologic side effects (e.g., tramadol, methadone, etc.)

Measurable objective:

1. Can determine when to use oral vs parenteral iron repletion
2. Can choose an appropriate first-line medication, based on patient's risk profile

Circadian therapies

Demonstrates familiarity with appropriate indications and optimal management of light and melatonin for circadian rhythm regulation

Measurable objective:

1. Can choose appropriate dose and timing of melatonin for circadian vs hypnotic effects
2. Can determine effects of light exposure at different times of the day, based on knowledge of the phase response curve

Positive airway pressure (PAP)

Accurately interprets positive airway pressure (PAP) data for assessment of efficacy or empiric machine adjustment and/or further polysomnography/PAP titration

- Selects appropriate PAP modality, based on the interpretation/report of a titration sleep study and/or the patient's sleep-related breathing disorder (e.g., bilevel for patients with neuromuscular hypoventilation)
- Appropriately interprets PAP compliance/treatment report data from a variety of manufacturer devices.
- Has familiarity with indications for less common modality and pressure settings available on multiple manufacturers' devices: bilevel, autobilevel, bilevel spontaneous/timed (S/T) mode, autoservoventilation (ASV), average volume assured pressure support (AVAPS)
- Is aware of the management of common problems encountered with PAP therapy, e.g., aerophagia
- Can identify and refer patients who may need PAP desensitization

Measurable objective:

1. Can define therapeutic targets for residual AHI (rAHI<5) and compliance (>4hrs nightly, >70% of nights)

Additional treatment options intervention

- Appropriately considers referral of patients with sleep-disordered breathing for surgical interventions
- Bariatric surgery
- Soft-tissue and/or skeletal craniofacial surgeries
- Hypoglossal nerve stimulator
- Appropriately considers referral of patients with sleep-disordered breathing for dental therapies
- Mandibular advancement device therapy
- Rapid maxillary expansion
- Appropriately considers alternative therapies for sleep-disordered breathing
- Positional therapy
- Dead space increases (via unhooked PAP mask), diamox for primary normocarbic central sleep apnea

Measurable objective:

1. Can identify at least one non-PAP therapy for the treatment of obstructive sleep apnea

Consultant referrals and allied health professionals

- Appropriately refers patients with sleep-wake disorders for consultation (psychology, psychiatry, movement disorders, autonomic disorders, neuropsychiatry, bariatric surgery, oromaxillofacial surgery, ENT surgery, PT/OT/ST)

Patient and family resources

- Effectively counsels patients and families regarding sleep-wake disorders and refers to appropriate resources and support groups
- American Sleep Apnea Association and MyApnea.org
- Restless Legs Syndrome Foundation

- Narcolepsy Network
- Hypersomnia Foundation
- Kleine-Levin Syndrome Foundation

Part II. Syndromes and Specific Sleep-wake Disorders

Demonstrates sophisticated and detailed knowledge of pathophysiology, differential diagnosis, mimics, diagnostic testing, and controversies in:

- Insomnia
  - Acute Insomnia
  - Chronic Insomnia Disorder
- Sleep-Related Breathing Disorders
  - OSA (Adult)
  - OSA (Pediatric)
  - CSA Syndromes
  - Sleep-Related Hypoventilation Disorders
- Central Disorders of Hypersomnolence
  - Narcolepsy, Type 1
  - Narcolepsy, Type 2
  - Idiopathic Hypersomnia
  - Kleine-Levin Syndrome
- Circadian Rhythm Sleep-Wake Disorders
  - Delayed Sleep-Wake Phase Disorder
  - Advanced Sleep-Wake Phase Disorder
  - Irregular Sleep-Wake Disorder
  - Shift-work Sleep Disorder
- Parasomnias
  - Disorders of Arousal from NREMS
  - REM-Sleep Behavior Disorder
- Sleep-Related Movement Disorders
  - Restless Legs Syndrome
  - Periodic Limb Movement Disorder

Effectively manages common and uncommon sleep-wake disorders caused by, exacerbating, and associated with neurologic disease (stroke, epilepsy, idiopathic intracranial hypertension, headache, dysautonomia, movement disorders and neurodegenerative diseases, autoimmune encephalitides, inpatient delirium). Below is a table of considerations for sleep-wake/circadian disorders that might manifest in or affect conditions commonly encountered in some of the neurological subspecialties:

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SLEEP DISORDER CATEGORY						
Neurology subspecialty	Insomnia	Sleep-related breathing disorders	CNS hypersomnias	Circadian	Parasomnias	Sleep-related movement disorders
Autonomic	POTS UARS/SDB	Idiopathic hypersomnia				Periodic limb movements of sleep and RLS
Behavioral & cognitive	Neurodegenerative diseases Neurocognitive effects of Rx	OSA<>neurodegenerative diseases	MDD as pseudodementia	Irregular sleep-wake in dementias	REMS-behavior disorder	RLS
Vascular		OSA<>stroke Central sleep apnea	Stroke<>fatigue Brainstem & thalamic infarcts			
Child	Behavioral insomnias Neurodevelopmental disorders Autism	ADHD & other neuropsych	NT1 Inborn errors of metabolism	Normal circadian phase delay and management	Night terrors NREMS parasomnias vs Sz	RLS or PLMD
Epilepsy		Refractory epilepsies	Cataplectic spells (NT1)	Circadian/infradian Sz variation	Nocturnal hypermotor epilepsy	
Headache & facial pain	Behavioral insomnias	IIH CO2<>AM headache		Cluster headache Hypnic headaches Other headache syndromes	Exploding head syndrome	
Inpatient (ICU, hospitalist, etc.)	Delirium, TBI	Post-op Acute stroke	Coma, persistent vegetative state, minimally conscious state TBI	Delirium		
Movement disorders		PD/MSA and OSA, stridor,or CSA		Irregular sleep-wake patterns	REMS-behavior disorder	RLS,propriospinal myoclonus
MS and immunology			Encephalitides (Ma2, NMO, NMDA encephalitis) MS<>fatigue		RBD	RLS in MS
Infectious diseases	Fatal familial insomnia, encephalitides					
Neuromuscular		Hypoventilation syndromes	Myotonic dystrophy			RLS in neuropathies

Educates others about diagnostic reasoning and management of sleep-wake disorders.