Table e-1: Competencies and Learning Objectives: General Clinical Approach (Expanded)

Patient Care and **Medical Knowledge:** Develop clinical expertise in the care of people with MS and NID
1. Basic MS and NI knowledge
a. Pathology and pathogenesis
i. Demonstrates knowledge of pathogenesis of MS and NID
ii. Demonstrates knowledge of MS and NID neuropathology and immunopathobiology
b. Genetics
i. Understands the genetic influences in MS and NID
c. Epidemiology
i. Understands the epidemiology of MS and NID, including environmental influences
d. Disease course and prognosis
i. Demonstrates knowledge of relapsing and progressive MS disease courses and prognoses
ii. Demonstrates knowledge of the disease courses and prognoses of other NID
e. Special populations
i. Recognizes unique characteristics of MS and NID in pediatric patients
ii. Recognizes unique characteristics of MS and NID in geriatric patients
iii. Recognizes unique characteristics of MS and NID in ethnic and racially diverse populations
iv. Recognizes reproductive issues associated with MS and NID
2. Clinical evaluation
a. History: Effectively obtains a complete, relevant, and organized NID history including:
i. Relevant history pertaining to symptom onset, relapses, and disability (impairments of activities of daily living)
ii. Relevant family and social history
iii. Comprehensive review of systems pertinent to NID and differential diagnosis
iv. Relevant exposure history
b. Physical exam:
i. Efficiently and accurately performs relevant parts of the general medical exam
ii. Efficiently and accurately performs a comprehensive neurological exam
c. Clinical rating scales:
i. Demonstrates knowledge of historical development and appropriate application of disability outcome measures for MS and NID including scales based on the neurological exam (e.g. Expanded Disability Status Scale [EDSS]) or neuroperformance tests (e.g. MS Functional Composite [MSFC])
ii. Demonstrates expertise with rater-based and patient reported outcome measures for health-related quality of life assessments
3. Diagnostic evaluation and disease monitoring
a. Develop the skills necessary for efficient/accurate diagnosis of MS and NID
i. Demonstrates knowledge of historical development and appropriate application of current diagnostic criteria for MS and NID

ii. Demonstrates knowledge of the differential diagnosis for MS and NID and the risk and consequences of misdiagnosis
1. Identifies, orders, and interprets appropriate diagnostic testing
2. Recognizes common and unusual clinical manifestations of MS and NID
3. Recognizes red flags that could suggest an alternate diagnosis
4. Effectively manages MS misdiagnosis
b. Imaging
i. Develops the skills to interpret MRIs of brain and spine
1. Identifies MRI findings that are consistent with demyelinating disease according to current imaging criteria
a. Recognizes and understands significance of historic imaging criteria
2. Differentiates demyelinating vs non-demyelinating MRI findings
3. Utilizes MRI appropriately to monitor disease activity and severity
4. Demonstrates knowledge of advanced imaging techniques and quantitative imaging analysis, and recognizes their role in diagnosis and management
ii. Recognizes and interprets optical coherence tomography (OCT) abnormalities associated with demyelinating CNS diseases
iii. Utilizes other imaging diagnostic tools as appropriate
c. Cognitive testing
i. Recognizes and understands the importance of cognitive screening
ii. Requests formal neuropsychological testing and interprets results appropriately
d. CSF testing
i. Requests CSF testing as appropriate
1. Understands risks of lumbar puncture, management of potential complications, and strategies to reduce risk
ii. Accurately interprets results of CSF diagnostic testing, including routine studies, oligoclonal banding and other tests of intrathecal antibody production, and specific autoantibody testing
e. Laboratory testing
i. Understands the basic principles of commonly used lab techniques including PCR, ELISA, cell-based assay, Western blots, immunofluorescence, next generation sequencing, etc., including their limitations.
ii. Appropriately orders and interprets specific CNS and systemic autoantibody testing (individual tests and panels of tests) during the diagnostic workup of suspected NID
f. Neurophysiologic testing
i. Requests evoked potential studies as appropriate.
ii. Requests EMG/NCV as appropriate for differential diagnosis and disease management of NID
g. Pathological testing
i. Recognizes diagnostic yield and cost-effectiveness of pathologic testing and refers appropriate patients for CNS biopsy
4. Treatment strategies and side effects

a. Demonstrates sophisticated understanding of treatment subtleties and controversies in MS and other NID
i. Immunotherapies
1. Demonstrates knowledge of immunotherapies used for MS and NID including:
a. Mechanisms of action
b. Appropriate selection of DMT (initial, switching, discontinuation)
c. Well-versed in required safety monitoring of DMTs
d. Appropriate management of DMT side effects and complications
e. Understands and applies the appropriate management for complications of immunotherapies
2. Demonstrates knowledge of subtleties related to use of immunotherapies in special populations, including those who are infected, at risk for infection, or with medical comorbidities
3. Demonstrates knowledge of immunotherapies used for other systemic disorders (rheumatologic, neoplastic) and related complications
a. Recognizes and manages immunotherapy-associated neurological syndromes
4. Identifies and appropriately manages treatment issues in special patient populations (pregnancy, breastfeeding, pediatric, geriatric)
5. Demonstrates knowledge of role of vaccinations in disease management and impact of immunotherapies on vaccine timing, response, and precautions
ii. Appropriately assesses and manages acute relapses
iii. Symptomatic therapies
1. Demonstrates expertise with using screening and monitoring questionnaires and scales for common symptoms
2. Effectively implements pharmacologic and non-pharmacologic interventions to treat day to day symptoms associated with MS and NID
iv. Identifies comorbidities that can impact treatment selection and disability progression
Systems-Based Practice
1. Consultant referrals & allied health professionals
a. Understands the scope of practice and services offered by allied health subspecialties
b. Appropriately refers patients for consultation with other subspecialties
2. Patient & family resources
a. Effectively counsels patients regarding diagnosis, natural history, treatment options, side effects, lifestyle management
b. Effectively and empathetically communicates bad news
c. Appropriately communicates with patient and their care team when a misdiagnosis of MS or another NID has previously been made
d. Effectively counsels patients and their care team re: nonpharmacologic interventions (exercise, nutrition, etc.) for improved quality of life.

e. Demonstrates knowledge of appropriate educational resources/support and refers patients to these (e.g. National MS Society, Autoimmune Encephalitis Alliance)
3. Other systems issues
a. Demonstrates knowledge of managing insurance issues, health care system issues, access to care, access to infusions, etc., through collaboration with interdisciplinary teams, foundations, and the pharmaceutical industry
Practice-based Learning and Improvement
1. Demonstrates the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence into patient care and medical knowledge, and to continuously improve patient care based on constant self-evaluation and lifelong learning
Interpersonal and Communication Skills
1. Demonstrates interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals
2. Listens and understands the goals and values of each individual and incorporates these priorities into shared decision making
3. Demonstrates ability to communicate effectively to professional and lay audiences
Professionalism
1. Educates other healthcare providers about best practices for managing MS and NID, including timing of immunomodulatory therapy, early effective therapy, etc.
2. Demonstrates lifelong commitment to scholarly activity through conference attendance and self-directed review of current literature and updates to the field
3. Engages with professional MS and NID organizations and patient groups
4. Demonstrates leadership and the ability to work in a team
5. Recognizes and manages conflicts of interests
6. Adheres to standards of ethical behavior and professional conduct
7. Demonstrates cultural competency and recognizes potential for implicit bias
8. Effectively adapts to contemporary issues that affect delivery of care (e.g. telemedicine)