

WOMEN'S NEUROLOGY CURRICULUM – COMPETENCIES



Women's Neurology is a specialized curriculum that explores important aspects of neurologic care through the lens of sex and gender across the lifespan. This curriculum identifies core competencies in five key subspecialties of neurology including headache, cerebrovascular diseases, demyelinating diseases, epilepsy, and neuromuscular diseases as it pertains to pathophysiology, clinical approach, diagnostic evaluation, and treatment strategies. The following table outlines a "road map" then expanded by the detailed curriculum, which follows.

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- Emerging Subspecialties—Involve experts within other fields including Movement Disorders, Traumatic Brain Injury, Behavioral Neurology, Functional Neurological Disorders, Neuro-oncology, Autoimmune Neurology to provide an up-to-date best-evidence curriculum.

WOMEN'S NEUROLOGY CURRICULUM – COMPETENCIES



Across the Lifespan	Headache and Pain	Cerebrovascular Disease	Demyelinating Disease	Epilepsy	Neuromuscular	Emerging Fields
Women of Reproductive Potential						
Pathophysiology	Influence of hormones on disease risk, menstrual disease exacerbation, and family planning considerations					
Clinical Approach	History, general physical exam, neurological exam as it pertains to women of reproductive potential					
Diagnostic Evaluation	Laboratory, imaging, neurophysiological and specialized testing for women of reproductive potential					
Treatment Stages	Acute care, primary and secondary preventative care in women of reproductive potential					
Pregnancy, Postpartum and Lactation						
Pathophysiology	Influence of hormonal and physiological changes in pregnancy and postpartum, embryogenesis, fetal development as well as lactation considerations in specific in neurological disease					
Clinical Approach	History, general physical exam, neurological exam of pregnant and postpartum women					
Diagnostic Evaluation	Laboratory, imaging, neurophysiological, and specialized testing during pregnancy including safety profile of testing (i.e. imaging)					
Treatment Stages	Acute care, primary care, and secondary prevention modalities available for disease onset, exacerbation during pregnancy and lactation					
Ageing and Menopause						
Pathophysiology	Influence of hormonal and physiological changes associated with aging and menopause on cognition, bone health, and neurological disease					
Clinical Approach	History, general physical exam, neurological exam in aging and menopause including sex-specific disparities					
Diagnostic Evaluation	Laboratory, imaging, neurophysiological, and specialized testing in aging and menopause including sex-specific disparities and bone health testing					
Treatment Stages	Acute care, primary care, and secondary prevention modalities available for aging and menopause					

PART I - NEUROLOGIC ILLNESS ACROSS A WOMAN'S LIFESPAN

Sex and gender are key factors influencing neurological care from diagnostic criteria to therapeutic options and long-term outcomes. Sex is defined by biological aspects such as genetics, gonads, and genitals (“the three g’s”) and best represented by terms female, male, and intersex. In contrast, gender is defined by social and cultural constructs and best represented by terms women, men, and non-binary. The women’s neurology curriculum integrates both sex and gender issues in clinical care. In the context of gender, the term “women” in this curriculum refers to cis-gendered women. As this field develops and more evidence-based information becomes available in populations such as transgender women, intersex, LGBTQ2S+, and non-binary populations, we hope to build in a collaborative and inclusive way to integrate these emerging topics as it pertains to sex and gender issues in neurology. A woman’s life stage may influence neurologic illness due to important hormonal and physiological changes. Three main life stages are highlighted and include key measurable objectives. These life stages include: (a) women of reproductive potential, (b) pregnancy and postpartum, and (c) aging and menopause.

Life Stage 1- Women of Reproductive Potential

In women of reproductive age with neurologic disease the key question to ask is “Are you planning pregnancy?” This will frame the clinical approach. If pregnancy is not being planned, then appropriate contraceptive choices need to be discussed. If pregnancy is being planned, safe medication choices, and the importance of achieving disease stability prior to pregnancy are the key consultative elements. There should also be a dialogue on how her disease may affect pregnancy and how pregnancy may affect her neurologic condition.

General Aspects of History and Clinical Assessment within Life Stage 1

- Obtain a sexual and menstrual history and assess the risk of unplanned pregnancy
- Acquire a contraceptive history, adverse effects and review contraceptive options
- Obtain a detailed pregnancy history including prior miscarriage, therapeutic abortion, pregnancy-related complications such as hypertensive disease
- Assess for endogenous hormonal influences on disease exacerbation and/or progression
- Assess for exogenous hormonal influences on disease exacerbation and/or progression
- Review plans for future pregnancy

Life Stage 2 - Pregnancy and Postpartum Health

Conceiving may be natural or through assisted reproductive therapy (ART). Women undergoing ART may be at risk for disease exacerbation. During pregnancy and the postpartum period, important physiological and psychosocial changes occur that impact neurologic disease. These factors are the key learning points as it pertains to obstetrical and postpartum pathophysiology. Pregnancy is a time of significant physiological and neuroendocrine change with potential impact on neurological disease and therapeutics. Physiological changes (weight, volume, protein, fat distribution, hepatic metabolic and renal clearance changes in pregnancy) as well as key changes in placental and embryonic development are vitally important. Knowledge of these changes impact therapeutic choices for women with neurologic illness. Labor and delivery pose unique risks to disease exacerbation, and it is important to consider appropriate mode of anesthesia and its potential risks. Postpartum changes may also influence disease exacerbation, serum drug levels, and predispose women to a first presentation of a neurological illness. Lactation is an important consideration as medications can be transmitted through breast milk and affect the nursing infant. Additional postpartum changes including sleep deprivation, psychosocial stressors, and caregiver roles which influence neurological disease manifestation and disease stability.

General Aspects of History and Clinical Assessment within Life Stage 2

- Review the safety of medications in pregnancy and lactation
- Potential risk to mother and baby if medications are abruptly discontinued.
- Recognize indications and safety of testing such as magnetic resonance imaging (MRI), computed tomography (CT), and contrast agents during pregnancy and lactation
- Identify risk factors for disease exacerbation, disease quiescence or disease progression in pregnancy and postpartum

Life Stage 3 - Women and Aging/Menopause

As a woman ages and her hormonal profile changes, her neurologic diseases may be affected. Women with epilepsy are at risk for premature menopause and a change in seizure patterns related to her hormonal transition. Hormonally related neurological diseases such as menstrual migraines and catamenial epilepsy can potentially worsen during the menopausal transition requiring closer neurological follow-up. Common vasomotor symptoms can potentially mimic a demyelinating disease flare and require coordinated evaluation and management between gynecology and neurology. Unfortunately, stroke risk factors become more prevalent as a woman ages and attention to primary and secondary stroke prevention across menopause is critical. Menopausal hormone therapy and risk of stroke as well as its effect on epilepsy becomes essential. Bone health is a very important consideration in this life phase particularly the physiological metabolism of antiseizure medications (ASMs) and bone health. In conclusion, women's neurological issues do not end with pre-conception, pregnancy and lactation but continue across a woman's lifespan.

Key Aspects of History and Clinical Assessment within Life Stage 3

- Identify sex and gender specific risk factors for disease exacerbation and progression due to aging including reproductive and pregnancy history
- Identify the influence of disease and treatment on bone health
- Identify the influence of menopause on the neurologic disorder
- Identify the influence of menopausal hormone therapy on the neurologic disorder
- Assess cerebrovascular risk factors among older women
- Careful assessment for sleep disorders and effects on the neurologic disorder

PART II - DETAILED DISEASE-SPECIFIC CURRICULUM

SUBSPECIALTY 1 – HEADACHE

Preamble

The history and exam should focus on factors pertinent to headache. Specifically for women the pathophysiology of primary headache (HA) disorders in response to the menstrual cycle, exogenous hormones, pregnancy/postpartum and discussion of treatment options.

SECTION 1A

Women of Reproductive Potential with Headache and Pain

Pathophysiology

Demonstrate applied knowledge on the role of intrinsic and extrinsic hormonal influences (estrogens and progestins) in menstrual-related migraines and menstrual exacerbation of pain

Demonstrate understanding of the physiological changes in pregnancy such as increased blood volume, protein and fat redistribution, alterations in hepatic metabolism and renal clearance and apply a working knowledge of its impact on

- Secondary headaches (i.e., vascular, tumor-related, hydrocephalus, idiopathic intracranial hypertension, reversible cerebral vasoconstriction syndrome (RSCVS), post-dural puncture headache and compressive neuropathic pain syndromes)
- Therapeutic drug choices

Clinical Approach

History

Acquire information on reproductive health including menses (regular or irregular menses, perimenopause, or menopause) or extrinsic hormones (hormonal contraception or menopausal hormone therapy) as potential triggers for headache

Treatment strategies and side effects

Counseling:

- Counsel about the small risk of stroke related to migraine with aura
- If patient plans to conceive, consider headache medication planning prior to conception, during pregnancy (especially any potential risks with fetal exposure) and effect of the headache disorder on pregnancy outcome
- If there are no pregnancy plans, discuss appropriate contraception

SECTION 1B Pregnant and Breastfeeding Women with Headache

Clinical approach

- History of contraceptive use and effect on headache
- Understand the effect of the headache disorder on pregnancy outcome
- Understand the relationship of how pregnancy and postpartum states may affect headache type and increase the risk of secondary headaches
- Understand the neurologic features of preeclampsia and eclampsia
- Discuss the risks of pain medication in pregnancy and breastfeeding

Treatment strategies and side effects

Demonstrate knowledge of treatment and controversies in the management of primary headache disorders and common secondary headache disorders such as idiopathic intracranial hypertension (IIH) during pregnancy and postpartum

Counsel around the use of medications and devices during pregnancy/breastfeeding and pregnancy complications related to their headache condition

Differentiating primary vs. secondary headache disorders

- Safety of imaging modalities during pregnancy
- Discuss dangerous secondary headache disorders in pregnancy
- Discuss IIH in pregnancy and management
- Establishing typical patterns for HA patterns throughout pregnancy
- Discuss the impact of migraine on pregnancy

Therapeutic Options

- Discuss non-pharmacological therapy for treatment of HA during pregnancy
- Discuss safety of medications used preventatively and acutely
- Discussion of the newest HA agents – calcitonin gene-related peptide receptor (CGRP) antagonists, and ditans and best available pregnancy data
- Discuss procedures and devices used to treat primary HA disorders during pregnancy

SECTION 1C Aging and Menopause Effects on Women with Migraine

Pathophysiology

Demonstrate advanced knowledge on the role of intrinsic and extrinsic hormonal influences (estrogens and progestins) in menstrual related migraine in the context of perimenopause and menopause

Clinical Approach

- History of contraceptive use and effect on headache
- History of prior evaluation of headache prior to menopause
- Discuss appropriate use of hormonal therapy for menopausal symptoms
- Counsel about the small risk of stroke related to migraine with aura

Treatment strategies and side effects

Recognize headache patterns especially menstrual associated migraines can worsen in the menopausal transition in hormonally sensitive headaches and the need to aggressively treat hormonally sensitive headaches

SUBSPECIALITY 2 - CEREBROVASCULAR DISEASE

Preamble

The history and exam should concentrate on factors pertinent to cerebrovascular (CV) disease including risk factors and any prior history of adverse pregnancy outcomes (APO) and include preeclampsia, eclampsia, gestational diabetes. CV risk factor modification and treatment strategies should be reviewed prior to and at the beginning of pregnancy.

SECTION 2A

Women of Reproductive Potential & Cerebrovascular Disease

Pathophysiology

- Demonstrate applied knowledge on the role of intrinsic and extrinsic hormonal influences (estrogens and progestins) in thrombotic stroke (arterial and venous)
- Demonstrate advanced knowledge on the unique role of metabolic, vascular, cardiac, inflammatory factors on stroke risk in young women
- Demonstrate advanced knowledge on the role of previous APO on risk of stroke

Clinical approach

Women with a history of stroke and family planning

Demonstrate advanced knowledge of stroke prevention

- Examine age of menarche and risk of stroke
- Discuss use of hormonal contraception (oral contraceptives, injectables, implantables, intrauterine devices) and risk of stroke
- Discuss behavioral and lifestyle factors and risk of stroke (smoking, alcohol, drug use, physical activity, dietary habits, sleep, social and emotional state)
- Discuss history of prior pregnancies and any related APO
- Demonstrate knowledge around pre-pregnancy counseling for women with a history of stroke

SECTION 2B

Pregnancy, Lactation & Cerebrovascular Disease

Pathophysiology

Demonstrate understanding of the physiological and hemostatic changes across all stages of pregnancy and postpartum that may impact stroke syndromes

- Thrombotic stroke (arterial and venous)
- Cardioembolic stroke (artificial valves, intracardiac thrombus, arrhythmias)
- Cryptogenic stroke (intracardiac shunts, etc.)
- Vascular malformations (arteriovenous malformations, cavernomas, aneurysm)

- Vasculitis (primary, secondary)
- Vasculopathies (cervicocephalic dissection, residual flaps, pseudoaneurysms, Moya Moya, connective tissue diseases)

Clinical approach

Pregnant Women with a Prior History of Stroke

- Utilize antenatal and intrapartum risk factors screening
- Individualize a stroke prevention management plan based on type of stroke and medication requirements throughout the pregnancy
- Utilize a team approach to high- risk pregnancy and delivery modalities

Women with Stroke Onset During Pregnancy

- Obtain patient's reproductive priorities regarding pregnancy planning- medication for secondary stroke prevention plan during pregnancy, effect of the stroke on pregnancy and labor
- If acute stroke during pregnancy, explore patient's wishes and goals of care however, treatment should not be delayed, and pregnant women should have rapid access to acute stroke intervention

Diagnostic evaluation

Imaging

- Order stat head CT, MRI and vascular imaging recognizing the pros and cons of radiation and contrast to fetus and impact on lactation
- Recognize the risks and potential benefits of iodinate and gadolinium-based contrast agents in pregnancy
- Avoid delays in accessing timely care, recognizing CT head provides negligible radiation to the fetus and MRI without gadolinium contrast can be obtained in pregnancy without risk of harm, with time-of-flight imaging used for vessel imaging

Treatment and Prevention

Treatment

Review management of acute stroke (ischemic and hemorrhagic) during pregnancy and postpartum

- Discuss thrombolytic and endovascular therapies in pregnancy
- Collaborate with multidisciplinary team including interventionalist, neurosurgery, anesthesia, and obstetrics to provide best evidence-based interventional treatments for stroke/intracerebral hemorrhage (ICH)/subarachnoid hemorrhage (SAH) in pregnancy as well as obstetrical and fetal monitoring

Discuss use of stroke prevention medications while lactating

Discuss maternal side effects, teratogenicity and fetal or neonatal adverse effects of proposed treatments

Prevention

Discuss primary or secondary stroke prevention therapies including:

- Antiplatelet, anticoagulation, antihypertensive, antihyperlipidemic, and oral hypoglycemic medications and insulin (indications/side effects/contraindications) in pregnancy and lactation
- Explore immunosuppressive agents if appropriate, and its safety in pregnancy and lactation
- Carotid disease management including endarterectomy and stenting indications, weighing the risks/benefits in pregnancy and lactation

Patent foramen ovale and atrial septal defect management in pregnancy if indicated

Discuss oral contraceptives (safety/risks) as it pertains current or prior history of ischemic stroke/cerebral venous sinus thrombosis (CVST)/ICH/SAH (safety/risks)

SECTION 2c Aging and Menopause in Cerebrovascular Disease

Pathophysiology

- Demonstrate advance knowledge on the cardiovascular risk and stroke in older women
- Demonstrate advanced knowledge on the role of intrinsic and extrinsic hormonal influences (estrogens and progestins) on stroke risk in the context of perimenopause and menopause

Clinical approach

- Perform comprehensive review of systems pertinent to stroke in women including history of preeclampsia, hypertensive disorders of pregnancy, migraine with aura

Stroke Prevention

- Discuss age and type of menopause (premature, surgical, medical, natural) and risk of stroke
- Discuss reproductive span (first menarche to menopause) and risk of stroke
- Recognize and discuss effect of risk factors of stroke that are stronger or more prevalent in women (migraine with aura, hypertension, diabetes, atrial fibrillation, depression)
- Review use of menopausal hormone therapy and risk of stroke in across the biological lifespan and specific to type of menopause
- Discuss importance of primary and secondary stroke prevention across menopause spectrum

SUBSPECIALITY 3 - DEMYELINATING DISEASE

Preamble

The history and exam should concentrate on factors pertinent to demyelinating disease. Treatment is individualized to use the disease modifying therapies (DMTs) and symptomatic medications best aligned with the patient's disease and current reproductive desires.

SECTION 3A Women of Reproductive Age with Demyelinating Disease

Pathophysiology

Demonstrate advanced knowledge on the role of intrinsic and extrinsic hormonal influences (estrogens and progestins) in multiple sclerosis (MS) and autoimmune disorders

- Intrinsic: menarche, menses, pregnancy
- Extrinsic: hormonal contraceptives, menopausal hormone therapy

Clinical approach

History

- Elicit reproductive goals and plans for the 1-3 years' time frame
- Discuss appropriate contraception
- Discuss need for planning- medication plan before conception attempt, during and after pregnancy: Is a washout period needed? What is the risk of rebound after stopping treatment versus the risk of early pregnancy exposure to treatment?

- Discuss effect of the disease on pregnancy outcome and effect of pregnancy on neurological outcome
- Assess MS activity in pre-conception phase, and the risk of MS activity increase intra-partum and post-partum
- Assess for completion of vaccines that are checked/repeated in pregnancy prior to starting immunomodulatory treatment
- Recommend prenatal folate and vitamin D supplementation

SECTION 3B Pregnancy and Breast feeding in Demyelinating Disease

Clinical approach

Demonstrate knowledge of medication safety during pregnancy

- Discuss management of DMTs prior to attempting conception. Is a washout period needed? What is the risk of rebound after stopping treatment versus the risk of early pregnancy exposure to treatment?
- Assess for use of symptomatic therapies and if incompatible with pregnancy, discuss switch before conception attempts

Guide scheduling of an MRI before conception for “baseline” and a postpartum surveillance MRI

Treatment strategies and side effects

- Demonstrate sophisticated knowledge of treatment subtleties and controversies in the management of MS/autoimmune disorders
- Advise how exclusive breastfeeding may be protective of inflammatory activity postpartum
- Demonstrate familiarity with immunomodulatory therapies and their side effects and safety during pregnancy and breastfeeding
- Recommend appropriate prenatal folate and vitamin D supplementation
- Symptomatic Treatment
- Discuss importance of mood stabilization before conception as well as postpartum
- Appropriately direct the appropriate use of symptomatic treatment in MS/autoimmune disorders during pregnancy and postpartum recognizing medication risks as well as risks of not treating during pregnancy and the postpartum period

SECTION 3C Aging and Menopause Effects in Women with Demyelinating Disease

Pathophysiology

Demonstrate advanced knowledge on common clinical scenarios encountered by women with MS during the menopausal transition

- Overlap in symptoms caused by aging, menopausal transition, and MS including poor sleep, mood changes (depression, anxiety, lability), fatigue, urinary and sexual dysfunction
- Need for more focused clinical management during the menopausal period to evaluate and treat symptoms

Demonstrate applied knowledge of menopausal vasomotor symptoms on MS symptom fluctuation

- Articulate latest risks and benefits of menopausal hormone therapy in the general population and appreciate any MS-specific risks and benefits
- Articulate knowledge of non-hormonal treatments to alleviate vasomotor symptoms

Describe current state of evidence regarding possible acceleration in MS worsening after the menopausal transition

Clinical approach

- Obtain detailed history on symptoms that could arise from MS, aging and/or menopausal transition: sleep, mood, cognition, fatigue, urinary and sexual dysfunction
- Assess for cognitive changes that could arise from MS and/or aging
- Inquire about specific risk of osteoporosis and falls
- Inquire about infectious risks and vaccine history, including UTIs
- Collect detailed medication list with attention to possible interactions in aging females

SUBSPECIALTY 4 - EPILEPSY

Preamble

Highlighted below are specific issues pertaining to the care of women with epilepsy (WWE). Including need for disease stability prior to pregnancy, use of folate and use of antiseizure medication (ASM) regimens that best control epilepsy with the least risk of major congenital malformations (MCMs) and neurodevelopmental side effects.

SECTION 4A Reproductive Potential in Women with Epilepsy

Pathophysiology

- Demonstrate advanced knowledge on the role of intrinsic and extrinsic hormonal influences (estrogens and progestins) in catamenial epilepsy and WWE
- Demonstrate understanding of the physiological changes of pregnancy that may impact epilepsy and antiseizure medications

Clinical approach

- Obtain family history as it pertains to epilepsy, especially X-linked genetic syndromes that may be relevant to future pregnancy counseling
- Obtain a history of triggers including menses (catamenial epilepsy)
- Obtain a reproductive history including prior pregnancies, therapeutic or spontaneous abortions as well as fertility/infertility concerns
- Ascertain reproductive plans regarding pregnancy planning- medication plan during pregnancy, effect of the disease on pregnancy outcome
- Discuss appropriate contraception recognizing potential interactions between hormonal contraception, antiseizure medications, and seizure control

Diagnostic evaluation

- Consider tracking menses and seizures to confirm if WWE have catamenial epilepsy

Treatment strategies and side effects

Demonstrate knowledge of treatment and controversies of ASMs in the management of WWE

Understand the need for folic acid supplementation prior to conception

Understand which are the safest ASM regimens for a WWE planning pregnancy

Consider important multidirectional interactions of:

- Endogenous hormones and their fluctuation within the menstrual cycle and the potential effect on seizures and anti-seizure medications

- Exogenous hormones (oral contraceptive pill, fertility therapy) on seizures and antiseizure medications
- ASM interaction (especially enzyme inducers) on different forms of contraception

Appropriately direct use of symptomatic treatment in WWE for neuropsychiatric disorders including anxiety, depression, and their safety profile in pregnancy

Surgical intervention and referrals: Understand the safety profile of neuromodulation in pregnancy and timing of epilepsy surgery in the context of reproductive planning

Appropriately refer WWE to women's health specialists including fertility, gynecology, obstetrics and women's mental health

SECTION 4B Pregnancy and Breastfeeding in Women with Epilepsy

Clinical approach

- Establish a medication plan during pregnancy, integrating the effect of the disease and medication on pregnancy outcome
- Ensure medication compliance during pregnancy
- Discuss breast feeding plan including safety profile of antiseizure medications in breastfeeding
- Understand the risks of sudden unexpected death in epilepsy (SUDEP) especially during periods of high risk for seizure recurrence (i.e., non-compliance, sleep deprivation, stress during pregnancy)
- Screen for pregnancy-related and post-partum depression and anxiety

Physical examination

- Measure blood pressure and assess reflexes especially during pregnancy to monitor for risks of pre-eclampsia and eclampsia
- Assess for signs of drug toxicity (nystagmus, tremor, incoordination, balance difficulties) especially postpartum when drug levels may rise

Diagnostic evaluation

Imaging

- Recognize the indications and safety profile for MR and CT neuroimaging of brain in pregnancy including new onset seizures, or status epilepticus

Neurophysiology

Understand when EEG or LTM is needed especially in the context of new onset seizures or status epilepticus in pregnancy

Treatment strategies and side effects

- Counsel women on continued use of folic acid supplementation
- Understand the importance of maintaining stable ASM regimens for a WWE throughout pregnancy and the role of therapeutic drug level monitoring
- Adjust ASMs during pregnancy and postpartum period to optimize seizure control balanced by risks of fetal exposure and maternal drug toxicity

SECTION 4C Aging and Menopause effects on Women with Epilepsy

Pathophysiology

Demonstrate advanced knowledge on the role of intrinsic and extrinsic hormonal influences (estrogens and progestins) in catamenial epilepsy in the context of perimenopause and menopause

Clinical approach

Obtain a history of triggers including menses (catamenial epilepsy), pregnancy and post-partum influences on epilepsy

Understand that for women with catamenial epilepsy hormonal fluctuations in perimenopause may be associated with seizure exacerbation, and with menopause, disease stability

Understand that menopausal hormone therapy (HRT) may worsen seizures

Understand that post menopause there is an increased risk of osteoporosis further increased by the usage of some ASMs

Consider indications for bone mineral density

Treatment strategies and side effects

Demonstrate sophisticated knowledge of treatment subtleties and controversies in the management of ASM in WWE

Discuss premature menopause in women with epilepsy

Discuss potential changes in seizure patterns related to menopause and hormonal therapy during menopausal transition

Consider physiological metabolism of ASMs and bone health in women with epilepsy

SUBSPECIALITY 5: NEUROMUSCULAR DISORDER (NMD)

Preamble

Obtain a comprehensive history as in all NMDs. Treatment is individualized to use the therapeutics best aligned with the patient's disease and current reproductive desires. Counseling on the need for disease stability prior to pregnancy.

SECTION 5A Women of Reproductive Potential with Neuromuscular Disease

Pathophysiology

Demonstrate advanced knowledge on the role of menstrual cycle on muscle and neuromuscular function

Understand the etiology of endocrine-related myopathies

Demonstrate understanding of the physiological changes of pregnancy that may impact neuromuscular syndromes

- Myasthenia gravis
- Acquired and hereditary myopathies (inflammatory, mitochondrial, congenital)
- Acquired and hereditary neuropathies (GBS, CIDP, CMT, nutritional i.e., hyperemesis gravidarum, compressive neuropathies)

Clinical approach

History

Acquire understanding of reproductive plans regarding pregnancy—medication plan during pregnancy, effect of the disease on pregnancy outcome

Discuss appropriate contraception and need for planned pregnancy

Discuss the importance of disease stability prior to pregnancy, disease course during pregnancy and how exacerbations will be managed

SECTION 5B

Pregnancy and Breastfeeding in Women with Neuromuscular Disease

Clinical approach

History

Screen for involvement of cardiac or smooth muscle pathologic involvement in the NMD to discuss how that might affect labor and delivery

Medication plan during pregnancy, effect of the disease on pregnancy outcomes and medication safety during breastfeeding

Treatment strategies and side effects

- Demonstrate knowledge of treatment and controversies in the management of NMD during pregnancy and breastfeeding
- Appropriately direct use of immunomodulatory therapy during pregnancy and breastfeeding
- Discuss with obstetrics and anesthesiology a labor plan and which medications should be avoided
- For women with MG discuss with their providers appropriate treatment for preeclampsia, if necessary, medications to be avoided and need to screen for neonatal MG
- Appropriately direct use and counsel on safety of symptomatic treatment in NMD during pregnancy and breastfeeding.

SECTION 5C

Aging and Menopause effects on Neuromuscular Diseases

Clinical approach

Discuss how NMD can worsen with age especially in estrogen deficient states

Recognize comorbidities associated with women of advanced age that may impact NMD including osteoporosis, osteoarthritis, sarcopenia, nutritional deficiencies, and frailty

PART III – FUTURE DIRECTIONS

Our current Women's Neurology curriculum integrates sex and gender issues into the care of neurologic illness for women. As the curriculum evolves, we hope to open avenues to collaborate and integrate partner programs to ensure an inclusive and diverse curriculum that incorporates a more comprehensive curriculum of sex and gender issues across the lifespan.

1. Collaboration with AAN's LGBTQ Section to Build on Inclusivity and Diversity Themes Inherent in Women's Neurology

Women's Neurology began with a focus on cis-gendered women's issues in the context of neurologic illness. As our understanding of sex and gender expands to include a more nuanced understanding of male, female and intersex as well as cis-men, cis-women, transgender, and non-binary populations our curriculum will endeavor to collaborate with experts in this field to enable a more inclusive understanding of sex and gender issues.

2. Collaboration with AAN's Child Neurology Section to Integrate Childhood and Adolescence

Girls and female adolescents face unique considerations including genetic diseases that are exclusively or more likely expressed in young females such as Rett syndrome or juvenile myoclonic epilepsy. In addition, comorbidities such as neuropsychiatric illness such as anxiety, mood or eating disorders are more prevalent among girls. Development of self-identity as well as autonomy and sexual development occurs in these early years. Child neurologists will aid in identification and management of these sex and gender issues and enable best practices as this population transitions into adulthood.

3. Collaboration with AAN's Adults with Intellectual and Neurodevelopmental Disabilities Section

Females with neurodevelopment difficulties throughout all stages of life face unique considerations including neurodevelopment, autonomy, and sexual health. As well, impact of hormones, menses, contraception, family planning, and aging need to be considered in providing comprehensive care to patients and their families. Neurodevelopment neurologists will aid in identification and management of these sex and gender issues to enable best practices.

4. Integrating Additional Subspecialties as Research in this Field Grow:

As the understanding of how sex and gender impact neurologic disease grow, emerging data from other specialties are being established. These emerging areas will build on the foundational specialties highlighted within the current Women's Neurology curriculum. Subspecialties areas and Sections identified for future collaboration and development include (but not limited to): Autoimmune Neurology, Behavioral Neurology, Functional Neurological Disorders (FND), Movement Disorders, Neuro-oncology, Neuropsychiatry, Traumatic Brain Injury.