

Commentary

Women's Neurology: Why We Need a Subspecialty for Half the Population

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Introduction

Overview

Women's Neurology is an emerging subspecialty in the field of neurology. LaHue and colleagues recently published an article in the journal *Neurology*, highlighting the need for specialized training in women's neurology.¹ Currently, the University of Toronto offers the only Canadian training program for Women's Neurology. Still in its early years of development, as people learn about this specialty, a common question is why a subspecialty is needed for 50% of our population. These discussions raise important questions on whether a women's neurology subspecialty is needed in Canada and if so, *why*?

Sex Bias in Neuroscience Data

Sex is encoded in our DNA and is defined by reproductive organs and also other physiological and functional characteristics and defines the difference between female and male. Gender refers to social, cultural, and psychological traits linked to women and men. One important assumption is that neuroscience data equally addresses male and female factors from perspectives of disease pathophysiology, natural history, treatment response, and outcomes. This assumption is challenged when we explore sex bias and sex omission in neuroscience research. Sex bias in research is defined as a distortion of a scientific study result when sex is not factored in the data analysis, whereas sex omission is defined as the lack of reporting research subject sex.² Mamlouk and colleagues explored neuroscience research articles published in 2017 and assessed sex bias and omission in the literature.² Their literature review also analyzed the research model, reported National Institutes of Health (NIH) funding status, and journal. Although they saw an increased proportion of the use of both males and females in neuroscience research, they identified persistent sex bias and sex omission. Despite the improved documentation of using both males and females, articles that included males and females, *without* considering sex as an experimental variable, comprised the largest percentage of their data set at 44%. Sex omission varied considerably among similar journal types (Science vs. Nature) arguing for better individual journal policies and enforcement. As we gain a better understanding of the full scale and scope of sex and gender bias in

neuroscience data, there is an emerging recognition that sex and gender play an important role in the nervous system. Work is now underway to address the equity issues in this field. In 2016, the NIH created and implemented a policy regarding sex as a biological variable. They require sex as a biological factor be incorporated into research design, analyses, and reporting of results; they recognize that ignoring sex as a biological factor undermines the transparency and generalizability of research findings.² Similarly, in 2021, the Canadian Institutes of Health research (CIHR) as a signatory on the Government of Canada's Health Portfolio underscored similar policies and the importance of integrating sex (and gender) into health research when appropriate. When sex as a biological factor is integrated into data, this can alter our understanding of neurological disease. An example of this is the pain model; females experience pain through different pain pathways than males, yet our therapeutic interventions are heavily based on the traditional pathway of pain.³ If we consider sex as a biological factor in our research, we can ensure our future therapies are tailored appropriately as is expected in this new era of precision medicine.

What is Women's Neurology

Women's Neurology focuses on neurological conditions across a women's lifespan with key periods being pregnancy, postpartum, and menopause. Women have important sex- and gender-specific considerations, yet there are gaps in training that neurologists receive specific to this population.

One specialty that highlights these nuances is epilepsy, a neurological condition, affecting approximately 70 million people worldwide. Sex-specific considerations include catamenial epilepsy, fertility therapy, teratogenicity of certain antiepileptic drugs, seizure management during pregnancy, and therapeutic drug monitoring and dose adjustment in pregnancy. A Canadian study on neurologists' and neurology residents' knowledge of issues related to pregnancy for women with epilepsy identified less than half of physicians correctly identified adverse outcomes for most anti-seizure medications.⁴ Multiple sclerosis (MS) is a disease that has its onset most commonly during childbearing years with a threefold greater prevalence in women than men. Pregnancy can impact disease courses as well with many women experiencing worsening of migraine and

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MS, especially in the postpartum period. Despite these important sex- and gender-specific issues, only 44% of US residency program directors felt that trainees were sufficiently prepared to care for neurological conditions in pregnancy.¹ From the perspectives of neuroscience research, clinical care, and education, efforts to address sex and gender disparities are needed.

Women's Neurology Training

It is important for the neurology trainee and clinician to understand the long-term neurological sequelae of complications that specifically affect women. For example, obstetrical complications such as preeclampsia and preterm labor may have long-standing maternal health implications, including increased risk of cerebrovascular disease and cognitive dysfunction. These maternal outcomes can be observed years later. Thus, a detailed reproductive history is essential for all women irrespective of a woman's age or pregnancy status and can target modifiable factors in a woman's neurological health.⁵

There are currently limited educational opportunities not only for residents and fellows but also for practicing neurologists in Canada who want to advance their skills in women's issues in neurology.

In 2020, the Royal College of Physicians and Surgeons of Canada updated their training requirements and now focuses on competencies and training experiences.⁶ Within this list of core competencies is competency in "neurological complications of pregnancy and delivery." In addition to this, a more comprehensive women's health focus in neurology would include counseling and co-management of contraceptive options, pregnancy planning, fertility treatment in women with neurology illness, in addition to menstrual-related neurology, management of neurological illness in pregnancy, and the impact of perimenopause and menopause on brain health and neurodegenerative disease.

To address the gaps, the University of Toronto offers 1–2 month electives for residents to explore women's health through the life stages across subspecialties, including epilepsy, stroke, headache, and MS as well as neuroendocrine, maternal–fetal medicine, sleep medicine, concussion, and cognition. Since 2015, over 20 trainees have completed a women's neurology elective. In 2019, the University of Toronto established a 1-year accredited Women's Neurology Fellowship to acquire advanced skills in the treatment of neurological illness through the lens of sex and gender and contribute to the growing research in this field. The first Canadian Women's Neurology specialist graduated in 2021 and is establishing an obstetrical neurology practice at the University of Toronto.

From a research perspective, emerging Canadian research opportunities are available to help address these sex disparities. The MS program at the University of Toronto is part of a national observational prospective pregnancy study (CANPREG-MS) led by Dr. Sadovnick from UBC and are actively recruiting patients to participate. Mothers and their infants are followed from conception to 1-year postpartum. A population-based study is also underway to evaluate pregnancy outcomes in women with MS compared to the general population, to better understand the effects MS may have on pregnancy. The Women's Brain Health work is another example. This initiative is led by Dr. Aleksandra Pikula and Dr. Gillian Einstein and is a cross-collaboration between clinicians and basic scientists who are experts in their field in sex and gender

brain health. The goal is to bridge the knowledge gaps in women's brain health in neurology and related disciplines. Rounds occur monthly and include case reports, research in progress, and clinical studies on issues affecting women's brain health with or without concomitant diagnosis of a neurological condition and are supporting knowledge mobilization to scientific community, but also to general public. This community of collaborative work has been best embodied by the recently established international Women's Neurology e-Journal club, a community of like-minded educators from across North America, including University of Toronto, Harvard University, University of Pittsburgh, Stanford University, and University of California (San Francisco) to learn and collaborate on developing a Women's Neurology education curriculum.

The Future

This article by LaHue and colleagues primarily addresses Women's Health Neurology in the USA but raises important issues for our Canadian health system. The work in Women's Neurology builds on work done by others over the past decades that has gained momentum as the research, clinical, and education communities have recognized the sex and gender disparities within neurology. Through educational resources, research, educational opportunities for trainees and practicing neurologists, our Canadian neurology community will become more capable and proficient in caring for women with neurological diseases; in doing so, we work towards the new era of precision medicine.

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References

1. LaHue SC, Paolini S, Waters JFR, O'Neal MA. The need for specialized training in women's neurology. *Neurology*. 2022;100:1–42. DOI [10.1212/WNL.0000000000201451](https://doi.org/10.1212/WNL.0000000000201451).
2. Mamlouk GM, Dorris DM, Barrett LR, Meitzen J. Sex bias and omission in neuroscience research is influenced by research model and journal, but not reported NIH funding. *Front Neuroendocrinol*. 2020;57:100835. DOI [10.1016/j.yfrne.2020.100835](https://doi.org/10.1016/j.yfrne.2020.100835).
3. Presto P, Mazzitelli M, Junell R, Griffin Z, Neugebauer V. Sex differences in pain along the neuraxis. *Neuropharmacology*. 2022;210:109030. DOI [10.1016/j.neuropharm.2022.109030](https://doi.org/10.1016/j.neuropharm.2022.109030).
4. Roberts JL, Metcalfe A, Abdulla F, et al. Neurologists' and neurology residents' knowledge of issues related to pregnancy for women with epilepsy. *Epilepsy Behav*. 2011;22:358–63. DOI [10.1016/j.yebeh.2011.07.009](https://doi.org/10.1016/j.yebeh.2011.07.009).
5. Neiger R. Long-term effects of pregnancy complications on maternal health: A review. *J Clin Med*. 2017;6:76. DOI [10.3390/jcm6080076](https://doi.org/10.3390/jcm6080076).
6. Neurology Competencies and Neurology Training Experiences. Royal College of Physicians and Surgeons of Canada, 2020. Available at: www.royalcollege.ca/rcsite/ibd-search-e?N=10000033+10000034+4294967107&label=Neurology; accessed November 9, 2022.