I am honored to lead the Department of Neurology at the Medical College of Wisconsin. I am very proud of the work that we do; this Impact Report will highlight our accomplishments.

Our department is comprised of over 70 faculty in Adult Neurology, Child Neurology, Adult Neuropsychology, and Child Neuropsychology; our faculty are locally, nationally, and internationally recognized for their excellence in clinical care, research, and education.

Our clinical programs provide extraordinary, specialized care. We proudly partner with Froedtert Health, Children’s Wisconsin, and Clement J. Zablocki VA Hospital to provide innovative, high-quality care for all aspects of Neurologic disorders for all ages throughout Wisconsin, and beyond.

We conduct groundbreaking research from bench to bedside. Our expanding portfolio includes investigator driven basic and translational research along with clinical research trials; all of this work serves to advance knowledge and provide opportunities for the most innovative experimental care.

Our department assures the future of Neurologic care with ACGME accredited residency training programs in Adult and Child Neurology and fellowships in Neuropsychology, Neuroimmunology, Clinical Neurophysiology, Epilepsy, Headache, Vascular Neurology, NeuroEndovascular Surgery, Movement Disorders, and Neurocritical Care.

We are committed to diversity, equity and wellness among our faculty, staff, and trainees, and creating an environment of curiosity, safety, and inclusivity.

Please enjoy this Neurology Impact Report. For more information about our faculty and department, I invite you to visit www.mcw.edu/departments/neurology.

Dominic Fee, MD, FAAN, FAANEM, FACNS
Associate Professor and Interim Chair

Support research at the Medical College of Wisconsin Department of Neurology and the translation of knowledge into therapies to control, treat, and prevent the conditions that impact our community. Interested in donating to further research? Please contact us at Department of Neurology, 414.955.5235 or neurology@mcw.edu.

Thank you!
### ALS

The Medical College of Wisconsin ALS program at Froedtert Hospital has been designated a Center of Excellence by the ALS Association since 2006 and remains a top-tier center for patient care, education, and research. The ALS program serves most of Wisconsin, adjacent areas in Illinois, and the western UP of Michigan.

The ALS program is directed by Drs. David Shirilla and Dominic Fee. Dr. Paul Barkhaus started the first multidisciplinary clinic to serve veterans in the VA system which has also been designated by the ALS Association as a Center of Excellence.

<table>
<thead>
<tr>
<th>5</th>
<th>60</th>
<th>22</th>
<th>MUNIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical trials in the past two years</td>
<td>Topics Published</td>
<td>Publications in the last two years</td>
<td>Motor Unit Number Indexing (MUNIX) is a novel neurophysiological tool to estimate motor neuron loss in ALS and related disorders. This was developed at MCW by Drs. Barkhaus and Nandedkar and is becoming an internationally used surrogate marker for ALS progression in treatment trials.</td>
</tr>
</tbody>
</table>

### HEADACHE

Largest number of headache medicine providers for any institution in Wisconsin with 4 board certified or eligible headache medicine physicians, 3 advanced practice providers, and a pain psychologist.

- **TENSION**
- **MIGRAINE**
- **CLUSTER**

The Chronic Migraine program led to an 84% reduction in migraine disability days (MIDAS) and a 91% improvement in migraine quality of life score (MSQOL).

- Only dedicated multi-disciplinary program for the treatment of chronic migraine in the state.
- Only UCNS accredited fellowship in headache medicine in Wisconsin.
The Medical College of Wisconsin is home to comprehensive epilepsy programs for both adults and children. The Froedtert Hospital Comprehensive Epilepsy Program and the Children’s Wisconsin Comprehensive Epilepsy Program are accredited by the NAEC as Level 4 epilepsy centers. These centers provide patients access to multidisciplinary care teams with a full range of diagnostic and therapeutic options including both medical and surgical options.

Neuromodulatory Devices
Treatment Resistant Epilepsy

297 VNS devices implanted from 2010 to 2020

Devices implanted in 2021

27 VNS  8 RNS  3 DBS

Only magnetoencephalography (MEG) program in Wisconsin.

41 MEG studies for 2021

Epilepsy Surgery
Treatment Resistant Epilepsy

178 epilepsy surgeries from 2010 to 2020

Epilepsy Surgery for 2021

6 Single Stage Surgeries
14 Intracranial EEG Studies
32 Intra-operative ECoG/Awake Mapping

ADULT NEUROLOGY RESIDENCY
Shaping the Future of Neurology

Our residency graduates have gone on to fellowships in virtually all major subspecialties of Neurology

>800 Applicants for Match (March 2021)
MEMORY DISORDERS

Imaging Biomarkers in Mild Cognitive Impairment (MCI)
Drs. Malgorzata Franczak and Laura Umfleet, along with colleagues in neurology and neuroradiology, are conducting innovative research using cutting-edge brain MRI biomarkers to identify and study novel physiological mechanisms that predict cognitive dysfunction in patients with preclinical and prodromal dementia.

This work will inform future interventional studies to reduce the morbidity in the aging population.

The Gut-Brain Interactome

Recently, the memory disorders group has assembled a research team with expertise in evaluation the human gut microbiome, Alzheimer's Disease dysconnectivity, and Alzheimer's Disease symptomatology. Ongoing efforts will leverage shared innovative gut-brain models and state-of-the-art neuroimaging techniques to yield new discoveries in Alzheimer's Disease.

NEURO-IMAGING RESEARCH

MCW Neurology faculty are world leaders in research on how the brain processes language and speech. The Language Imaging Laboratory, directed by Dr. Jeffrey Binder, has been continuously funded by the National Institutes of Health for over 25 years and has produced landmark studies on how the brain perceives speech sounds, recognizes written words, and retrieves word meanings. For more information go to www.neuro.mcw.edu.

FATES

Dr. Binder and MCW faculty recently led a nationwide study called fMRI in Anterior Temporal Epilepsy Surgery (FATES), which tested these methods at 9 centers across the country and established the first standardized protocol for mapping language regions in the brain prior to surgery.

Other major NIH-funded studies led by Dr. Binder and colleagues include the Epilepsy Connectome Project, which aims to understand changes in brain network connectivity induced by epilepsy and Concept Representation in the Human Brain, which aims to understand how knowledge about the meaning of individual words is organized in the brain and how brain damage from stroke affects these networks.

NORMAL PRESSURE HYDROCEPHALUS (NPH) PROGRAM was established in 2009 by Dr. Franczak and is the only NPH program in the state of Wisconsin. The NPH program serves patients in Wisconsin, northern Illinois and Iowa.
Our Child Neurology program is the largest in Wisconsin with 14 faculty and 10 advance practice providers with expertise in general neurology, neurogenetics, neuroimmunology, epilepsy, neurocritical care, neonatal neurology, and neuromuscular medicine. The practice covers 6 remote sites throughout Wisconsin.

Our neonatal neurology program includes a dedicated inpatient service with discharged neonates following up in a structured 3 year outpatient multidisciplinary program to maximize their developmental outcomes (DREAM clinic). Additionally, the program interfaces with the prenatal high-risk obstetrics department for prenatal consults.

The neurocritical care program includes a multidisciplinary pediatric stroke and neurovascular program which includes both acute ischemic strokes but also other interventional procedures. The dedicated inpatient service also has a post-hospital discharge clinic (BRAIN clinic). Our neuromuscular program includes both an inpatient and outpatient service. Our clinics include a multidisciplinary Muscular Dystrophy Association and Parent Project Muscular Dystrophy Certified clinics as well as a multidisciplinary Brachial Plexus and Nerve Injury Clinic. Our group participates in NIH, industry, and investigator sponsored trials ranging from addressing acute flaccid myelitis to the use of near infra-red spectroscopy in epilepsy to exploring genetic modifying therapies in neuromuscular disease.

Our child neurology residency is unique in that it incorporates child neurology experience throughout the entire training process. After a year of internship as pediatric residents, they are paired with a basic science research lab where they spend a year (PGY2) on a specific project and topic before returning to their clinical training in child neurology.

Recent projects have included:

- Neurovascular injury secondary to TBI: Investigating markers of reactive gliosis
- Endoplasmic Reticulum (ER) stress in a cellular model of SMA
- Developmental time course of mechanical and thermal hypersensitivity using evoked stimuli and non-evoked ongoing assays for spontaneous pain

The program, accepting 2 residents per year, has had residents go on to practice in both academic and non-academic practices with specializations ranging from general neurology to headache medicine, neuromuscular medicine, neurogenetics, and epilepsy.
MS & NEUROIMMUNOLOGY

Our comprehensive MS center is designated as a partner in care by the National MS Society and a member of the Consortium of MS centers.

We are a national destination for patients with multiple sclerosis (MS), central nervous system autoimmune inflammatory disease, inflammatory optic neuropathies, chronic relapsing inflammatory optic neuropathies (CRION), neuromyelitis optica spectrum disorders (NMOSD) including anti-MOG disease, autoimmune encephalitis (AE), and Susac disease.

MOVEMENT DISORDERS

>100
Quarterly average number of new patients seen in Movement Disorders

47
Number of patients undergoing DBS implantation since July 2019

>225
Patients followed with DBS for Movement Disorders

We have the only fellowship training program in neuroimmunology and MS in Wisconsin.
Dr. Michael Collins is an internationally recognized authority on vasculitic neuropathies. He has chaired numerous workshops and committees on these disorders.

12 publications since 2019

Dr. Matt Harmelink, pediatric neuromuscular specialist, leads an expanding program utilizing cutting-edge therapies for such diseases as spinal muscular atrophy and Duchenne muscular dystrophy. The improvements and availability of genetic testing has facilitated making diagnoses in rare disorders. The NMDP program has also started a collaborative program with Plastic Surgery in the assessment and management of brachial plexus disorders in infants.

Diversity

The department established the Diversity, Inclusion and Wellness Committee (DIW) in the fall of 2020. Since then, the committee has conducted an internal gap assessment and identified areas of opportunity for learning and development. In FY22, the DIW committee rolled out an anonymous survey – Questions You Were Too Afraid To Ask – to further encourage curiosity and respectful discussions. With the approval of a diversity specific budget within the department in FY23, the committee will plan one educational event per quarter to continue to raise awareness on this important topic. More specific accomplishments and milestones can be found on the Department’s Diversity, Inclusion and Wellness Report.
NEURO-ONCOLOGY

1,000+ Patient cases are presented each year at the weekly comprehensive multi-disciplinary brain tumor board.

11 Clinical trials currently open for patients with brain tumors

12 Publications in the past year from the Neuro-oncology Translational Research Team

The Neuro-oncology team administers and hosts one of the largest brain banks of its kind to support brain cancer research. Because of the generosity of patients and their families, the Neuro-oncology team participates in ground-breaking research funded by the National Cancer Institute and the National Institutes of Health.

NEUROPSYCHOLOGY

>100 fellows trained in the >40 year history of the Neuropsychology Fellowship Program

Active research in multiple areas with over 100 publications in the past 5 years

- Technology and psychometrics in neuropsychological assessment - Dr. Umfleet
- Cognitive outcome in the pediatric brain tumor - Dr. Koop
- Performance and symptom validity - Dr. Vogt
- Congenital heart disease and cognition across the lifespan - Drs. Loman and Umfleet
- Neuropsychological outcomes in preschool age children with medical disorders - Dr. Heffelfinger
- Acute effects, recovery and outcome from traumatic brain injury in civilians, athletes and military service members - Drs. Brett, McCrea, and Nelson
- Aphasia Research and Recovery - Dr. Pillay
- Neuroimaging, the microbiome and neurodegenerative conditions - Dr. Umfleet
- Neuroimaging & cognitive outcome after epilepsy surgery - Drs. Swanson, Janecek, Koop, Pillay, and Conant
- TBI and neurological sequelae later in life - Dr. Brett
- Post COVID cognitive outcome - Drs. Bobholz, Swanson, and Umfleet
- Functional neuroimaging of typical and atypical reading development - Dr. Conant
- Concept representation in the human brain - Drs. Conant and Pillay
- How to operate a pediatric neuropsychology practice during the COVID-19 pandemic: Real tips from one practice's experience - Drs. Heffelfinger, Koop, Loman, and Vogt
Froedtert Hospital is a Comprehensive Stroke Center designated by The Joint Commission with 7 specialists in vascular neurology.

**Door-to-needle (DTN):** Froedtert Hospital consistently achieves some of the fastest times in the nation for acute ischemic stroke treatment with thrombolysis.

### Door to Needle – Eligible Cases

<table>
<thead>
<tr>
<th>Year</th>
<th>Average # of Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY2019 (n=24)</td>
<td>22.7</td>
</tr>
<tr>
<td>CY2020 (n=15)</td>
<td>36.3</td>
</tr>
<tr>
<td>CY2021 (n=29)</td>
<td>33.0</td>
</tr>
<tr>
<td>CYTD2022 (n=8)</td>
<td>28.9</td>
</tr>
</tbody>
</table>

**RESEARCH**

>180 Active Research Studies

- ALS
- Child Neurology
- Epilepsy
- Headache Medicine
- Language and Cognition
- Memory Disorders
- Movement Disorders
- Multiple Sclerosis & Neuroimmunology
- Neuromuscular Medicine
- Neuropsychology
- Stroke

**DEPARTMENT OF NEUROLOGY**

414.955.5235 | WWW.MCW.EDU/DEPARTMENTS/NEUROLOGY
DEPARTMENT OF NEUROLOGY FACULTY

Interim Chair
Dominic Fee, MD

Vice Chair, Education
Chad Carlson, MD

Vice Chair, Faculty Development
Amy Heffelfinger, PhD

Vice Chair, Research
Jeffrey Binder, MD

ADULT NEUROLOGY
Chief: Karen Blindauer, MD

Naveen Addagatla, MD
Christopher Anderson, MD
Piero Antuono, MD
Paul Barkhaus, MD
Humberto Battistini, MD
Patrick Bauer, MD
Ryan Brennan, DO
Staley Brod, MD
Chad Carlson, MD
Michael Collins, MD,
Jennifer Connelly, MD
Sheila Eichenseer, MD
Dominic Fee, MD*
Leonardo Fernandino, PhD
Juan Figueroa, MD
Jonathan Florczak, MD*
Malgorzata Franczak, MD*
Frederick Freitag, DO, Emeritus
Elías Granadillo-Deluque, MD
Sam Hooshmand, DO*
Eric Jackowiak, MD
Kathleen Kujawa, MD, PhD*
Xiaoyan Li, PhD
James Murtha, MD
Ahmed Obeidat, MD, PhD
Manoj Raghavan, MD, PhD
Bernd Remler, MD*
Fernando Santos-Pinheiro, MD
Fallon Schoemer, DO
Priyanka Shah, PhD
David Shirilla, DO*
Derrick Shumate, DO
Kirti Thumala, PhD
Aditya Vuppala, MD
Vahab Yousofzadeh, PhD

*VA Faculty

CHILD NEUROLOGY
Chief: Matthew Harmelink, MD

Elham Abushanab, MD
Samuel Adams, MD
René Andrade-Machado, MD
Nancy Bass, MD
Raquel Farias-Moeller, MD
Pradeep Javarayee, MD
Virginia Kaperick, MD
Niyati Mehta, MD
Lileth Mondok, MD
Hema Patel, MD
Namrata Patel, MD
Shannon Pollock, MD
Avantika Singh, MD
Harry Whelan, MD

NEUROPSYCHOLOGY
Chief: Sara Swanson, PhD

Joseph Amaral, PhD
Alissa Butts, PhD
Christina Casnar, PhD
Lisa Conant, PhD
Anthony Correro, PhD
Amy Heffelfinger, PhD, MPE
Julie Janecek, PhD
Jennifer Koop Olsta, PhD
Melissa Lancaster, PhD
Michelle Loman, PhD
Lauren Miller, PhD
Sara Pillay, PhD
Laura Umfleet, PsyD
Elisabeth Vogt, PhD

STROKE, NEUROINTERVENTION, CRITICAL CARE
Interim Chief: Dominic Fee, MD

Hatim Attar, MBBS*
Jeffrey Binder, MD
Diane Book, MD
Marek Cierny, MD
Pramod Gupta, MD
Ann Helms, MD, MS
Vijay Johnson, MD, MS
Marc Lazzaro, MD
Mohamed Osman, MD
Danish Pardhan, MD
Gregory Rozansky, MD
Rejan Sajjad, MD
Christopher Southwood, MD