

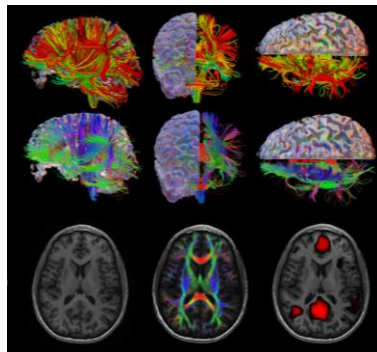


THE STROKE REHABILITATION CENTER

OF SOUTHEASTERN WISCONSIN



2019 Annual Report





THE STROKE REHABILITATION CENTER

OF SOUTHEASTERN WISCONSIN

Dear Colleagues,

Welcome to the 2nd Annual Report of the Stroke Rehabilitation Center of Southeastern Wisconsin. With generous support from Advancing a Healthier Wisconsin's "Optimizing Functional Outcomes of Stroke Survivors through Translational Research" and others, we have seen significant progress towards achieving our goals, including securing extramural funding.

The annual report highlights the strength of our partnership with Marquette University Department of Physical Therapy, MCW & MU Department of Biomedical Engineering, MCW Departments of PM&R and Neurology, CTSI, our Froedtert health system partner and community.

As we move forward, our goal is to further achieve advancements in rehabilitative care for stroke survivors, improving wholistic functional outcomes through innovation.

We are grateful to our patients, community stakeholders and partnering institutions for their continued dedication to advancing stroke rehabilitation research, and look forward to continued collaboration.

Sincerely,

A handwritten signature in black ink that reads "Diane Braza". The signature is fluid and cursive, with the first name "Diane" and last name "Braza" clearly legible.

Diane W. Braza, MD
Chair, Physical Medicine and Rehabilitation
Medical College of Wisconsin

A handwritten signature in black ink that reads "Jeanne M Hossenlopp". The signature is cursive and elegant, with the first name "Jeanne" and last name "Hossenlopp" clearly legible.

Jeanne Hossenlopp, PhD
Vice President for Research and Innovation
Marquette University



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Brian Schmit, PhD
Co-Director

We are thrilled to report on the progress of the Stroke Rehabilitation Center of Southeast Wisconsin (SRC). From new academic partnerships with the Department of Neurology at the Medical College of Wisconsin to an exciting community engagement effort that elevates the voices of stroke survivors and their loved ones, the SRC continues to advance cutting edge stroke rehabilitation research that directly impacts stroke survivors in Southeastern Wisconsin and beyond.

The power of the SRC partnership was highlighted by a 5-year \$2.3 million R01 grant from the National Institutes of Health awarded to SRC Core Faculty Allison Hynstrom, PhD (Physical Therapy, Marquette University) and Matt Durand, PhD (Physical Medicine and Rehabilitation, Medical College of Wisconsin). This exciting project showcases the importance of the Stroke Survivor Recruitment Database, which facilitated recruitment for the award's pilot data. To date, the SSRD has 267 stroke survivors, amplifying the ability to recruit interested and available research participants.



John McGuire, MD
Co-Director

The SRC awarded two, \$50,000 Clinical and Translational Seed Awards at the end of this fiscal year, posing exciting growth and collaboration opportunities for the coming year. Sara Pillay, PhD (Neurology, Medical College of Wisconsin) and Sabine Heuer, PhD (Speech Therapy, UW-Milwaukee) will explore cutting edge brain stimulation to improve speech therapy, while Jinsung Wang, PhD (College of Health Sciences, UW-

Milwaukee) and Erin McGonigle, MD (Physical Medicine and Rehabilitation, Medical College of Wisconsin) will examine new rehabilitation methods to improve function of the impaired limb after stroke. Seed funding for these studies is made possible through the SRC's Advancing a Healthier Wisconsin parent award.

The mission of the SRC is to improve functional outcomes for stroke survivors through novel, interdisciplinary research. Our journey towards this destination is strong and growing. We look forward to continued partnership in this exciting endeavor.

Sincerely,

Brian Schmit, PhD
Professor
Biomedical Engineering
Marquette University

John McGuire, MD
Professor
Physical Medicine and Rehabilitation
Medical College of Wisconsin



Transforming the lives of stroke survivors in Southeastern Wisconsin through interdisciplinary collaboration

Interdisciplinary collaboration leads to \$2.3 Million in stroke rehabilitation research funding

SRC Core Faculty Allison Hyngstrom, PT, PhD (Chair and Associate Professor, Physical Therapy, Marquette University) and Matt Durand, PhD (Assistant Professor, Physical Medicine and Rehabilitation, MCW) first met at the Clinical and Translational Science Institute's Clinical Research Scholars Program (CRSP) in 2011. Their shared dedication to stroke rehabilitation and alignment in research interests poised them as a powerful duo to advance novel techniques in stroke rehabilitation. Over the years, this collaboration has produced 3 peer-review manuscripts, 6 abstracts presented at national conferences, and 5 funded grants, including a recently awarded \$2.3M R01 grant that will study the effects of ischemic conditioning and exercise training on stroke rehabilitation. As part of the project, "Ischemic Conditioning and Improved Motor Function Post Stroke," they will perform clinical measures of motor function and measures of leg muscle strength, motor unit activity, vascular endothelial function, and cardiorespiratory fitness to assess the effectiveness of their intervention on neural and cardiovascular function post-stroke.

Dr. Hyngstrom received a master's degree in physical therapy from Washington University in St. Louis, MO. Following her clinical training, she worked for 3 years at the Rehabilitation Institute of Chicago where she primarily treated patients with neurological injury such as stroke. She then pursued her PhD. in neuroscience at Northwestern University in the laboratory of Dr. C.J. Heckman where she studied sensorimotor integration of spinal motoneurons. Dr. Hyngstrom came to Marquette in 2007 and completed a 1 year postdoctoral fellowship with Dr. Brian Schmit (Department of Biomedical Engineering). In the fall of 2008, she joined the faculty of the Department of Physical Therapy as an Assistant Professor. Dr. Hyngstrom's primary area of research is studying mechanisms of motor impairment, specifically muscle fatigue, in the chronic stroke population using a variety of biomechanical measurements.

Dr. Durand completed his PhD. at the Medical College of Wisconsin in 2010 where he studied vascular biology. He completed a postdoctoral fellowship with Dr. David Gutterman in the Department of Medicine where he was accepted into the CRSP, and was awarded a T32 Training Grant through the Cardiovascular Center in 2011. He completed his postdoctoral studies in 2015 and joined the Department of Physical Medicine and Rehabilitation in October 2015 as Assistant Professor. Dr. Durand also serves as the Research Director of PM&R. His research interests are microvascular function and deconditioning.

As the first major extramural award for a SRC collaboration, this is a hallmark achievement for the SRC and a win for stroke rehabilitation.



Allison Hyngstrom,
PT, PhD



Matt Durand, PhD



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Leveraging opportunities to reach stroke survivors through interdepartmental collaboration

Stroke is a complex event that is unique to each survivor. Due to the complexity of stroke multidisciplinary care teams are required. Clinicians specializing in how the brain works (neurology), motor recovery (physical medicine and rehabilitation), and others work together with the stroke survivor and their loved ones to identify the best path to recovery. Supporting the clinicians are countless support individuals, including physical, speech, and occupational therapists, nurses, nurse practitioners, and medical assistants, neuropsychologists, mental health therapists, and more.

Research in stroke rehabilitation requires many types of expertise, and one of the greatest barriers to research is participant recruitment. Over the past year, the SRC has significantly increased our partnership with the Department of Neurology at the Medical College of Wisconsin to recruit participants for the Stroke Survivor Recruitment Database (SSRD). The SSRD is a secure platform that allows the SRC to store contact information of stroke survivors who are interested in clinical research, along with information that helps researchers identify if a participant is a good fit for a study. This concentrated pool of interested participants allows researchers to enroll people into their studies faster – and allows the important findings from research studies to be leveraged to improve clinical care, inform treatment, or illuminate information about stroke recovery much more efficiently.

Stroke survivors are approached to enroll in the SSRD by Clinical Research Coordinator Rachel Minkin, MS while they recover in the Neurology inpatient unit at Froedtert Hospital. Patients also have an opportunity to enroll while in inpatient care with Physical Medicine and Rehabilitation, or in the PM&R outpatient clinic as well. In FY2019, the SSRD enrolled 96 stroke survivors, for a total of 230 stroke survivors in the database. Over 70% of all enrolled participants have been contacted to participate in a research study over the past year. Coordinating recruitment takes partnership between clinicians, nurses, and the research team and leads to great results. So far, stroke survivors enrolled in the SSRD have participated in pilot research studies leading to over \$2M in FY2020.

“The SRC has been instrumental in supporting the research I conduct by enhancing participant recruitment, collaborative resources, and access to resources that would not be possible without such infrastructure. I have directly benefited from a grant from the SRC to investigate the effects of electrical brain stimulation during speech therapy, and this work would not be possible without support from the SRC.”



Sara Pillay, PhD
Assistant Professor
Neurology, Medical College of Wisconsin
Clinical and Translational Seed Award Recipient



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Support for clinical and translational research

Advancing a Healthier Wisconsin

The Advancing a Healthier Wisconsin Endowment (AHW) continues to support the work of the SRC through pilot projects and infrastructure support. These key SRC projects aim to optimize functional outcomes for stroke survivors through clinical and translational research that have direct impact on this population. Current SRC research studies funded by AHW include: a) The Stroke Survivor Recruitment Database (SSRD), b) The Functional Outcomes Toolkit Study, c) Ischemic Preconditioning as an Intervention to Improve Stroke Rehabilitation, d) Changes in Brain Activation with Botulinum Toxin Therapy for Spasticity, and e) A New Training Paradigm to Reduce Motor Compensation During Pedaling in Subacute Stroke. Advances in these projects during FY2019 has led to extramural funding, publications, abstracts, and opportunities for collaboration.

Stroke Survivor Recruitment Database (SSRD)

- **Principal Investigator:** Matt Durand, PhD
- **Summary:** Searchable database for study investigators to contact interested potential stroke survivor research participants.
- **Recruitment:** Began February 2017. Froedtert Hospital Neurology and PM&R inpatient units and PM&R and Neuroscience outpatient clinics.
- **Status:** Currently enrolling. 96 Stroke survivors enrolled in the database in FY2019, for a total of 231 unique stroke survivors.

Functional Outcome Toolkit Study

- **Principal Investigator:** John McGuire, MD
- **Summary:** A panel of validated outcome measures in motor, sensory, cognitive and psychosocial function to measure functional status. This will give clinicians and researchers the power to reliably measure the impact of rehabilitation intervention on functional outcomes over time.
- **Recruitment:** Began May 2018. SSRD and FH inpatient rehabilitation unit
- **Status:** Currently enrolling. 7 participants enrolled in FY2019, total of 16 participants

Ischemic Preconditioning as an Intervention to Improve Stroke Rehabilitation (IPC)

- **Principal Investigators:** Matt Durand, PhD and Allison Hynstrom, PT, PhD
- **Summary:** Well-tolerated intervention in which blood flow to a certain part of the body is temporarily cut off using a blood pressure cuff.
 - IPC has shown to improve regional blood flow, motor neuron activity and muscle function.
 - IPC has shown to be effective in chronic stroke survivors and is now exploring the effects of IPC on inpatient acute stroke survivors.
- **Recruitment:** Began December 2016. FH PM&R outpatient clinic, FH inpatient rehabilitation unit
- **Status:** Closed to enrollment June 2018, data analysis complete. 27 participants with chronic stroke and 15 with acute stroke.

Pilot data from this project was used to submit an R01 to the National Institutes of Health, which was awarded July 1, 2019.



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Changes in Brain Activation with Botulinum Toxin Therapy for Spasticity

- **Principal Investigators:** John McGuire, MD and Brian Schmit, PhD.
- **Summary:** Botox injection therapy can be helpful in relieving muscle tightness, improving movement and overall physical function. This study identifies changes in brain connections in response to botulinum toxin therapy in stroke survivors prior to injection of botulinum toxin for treatment of spasticity and at 6 weeks post-injection.
- **Recruitment:** Began October 2017. SSRD
- **Status:** Closed to enrollment, data analysis ongoing. 10 participants with chronic stroke, and 10 non-stroke controls.

Initial results suggest increases in brain activation following therapy and increases in local brain connectivity.

A New Training Paradigm to Reduce Motor Compensation During Pedaling in Subacute Stroke

- **Principal Investigator:** Sheila Schindler-Ivens, PT, PhD
- **Summary:** Motor compensation after stroke is a behavior in which the unaffected limb performs tasks that are normally accomplished with the affected limb. Pedaling is used as a model for compensation during walking.
 - Brain activity is altered during pedaling in stroke survivors.
 - Participants will be trained to decrease compensation while pedaling on a device with small motors assisting the movement. This will translate to improvements in walking.
- **Recruitment:** SSRD
- **Status:** Open to enrollment.

This project was published in [Brain Connectivity](#) in May 2019.

Institutional support

Additional stroke-related research projects have been conducted in the affiliated research laboratories of the SRC. Funding for these projects has come through institutional support and support for research fellowships through the SRC. These projects make use of the SSRD for recruitment of study participants. Projects include a) Electroencephalographic measurements of arm movements in stroke, b) Changes in brain signals with fatigue post stroke, c) Altered dynamic stability in stroke survivors, and d) Imaging of structural changes in the brain after stroke.

Electroencephalographic measurements of arm movements in stroke

- **Principal Investigators:** Brian Schmit, PhD and Scott Beardsley, PhD
- **Summary:** The sensory signals influencing control of arm movement are altered in people with stroke. Altered sensorimotor networks controlling arm stabilization might underlie errors in control of arm movement.
 - Cortical signals are associated with stabilization.
 - Vibration alters cortical networks associated with arm movement.
 - Resting state brain networks identified using electroencephalography are altered in stroke survivors.
- **Recruitment:** 10 participants with chronic stroke, 20 nonstroke controls.
- **Status:** Closed to enrollment.

This study has been accepted for publication in the *Journal of Neurophysiology* (September 2019).



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Changes in brain signals with fatigue post stroke

- **Principal Investigators:** Brian Schmit, PhD, Allison Hynstrom, PhD
- **Summary:** Central fatigue is common in stroke survivors and could be the result of an inability to maintain descending drive.
 - Fatigue is being tested while measurements of electroencephalography and high-density electromyography of the wrist flexors is being conducted.
 - Electroencephalography measurements of brain activation are altered by fatigue, with evidence of decreased brain activity with fatigue in people with stroke.
- **Recruitment:** Began March 2017. SSRD, 10 participants with chronic stroke, 7 nonstroke controls.
- **Status:** Open to enrollment.

Altered dynamic stability in stroke survivors

- **Principal Investigators:** Brian Schmit, PhD
- **Summary:** Walking balance limits gait in people with stroke. Using a novel treadmill system mounted on a motion base and responses to balance perturbations were examined in people with stroke.
 - People with stroke appear to have an asymmetric response to balance perturbations.
 - People with stroke alter the way in which they synchronize with cyclical movements of the walking surface.
- **Recruitment:** SSRD, 10 participants with stroke, 10 non-stroke participants
- **Status:** Open to enrollment.

Imaging of structural changes in the brain after stroke

- **Principal Investigators:** Brian Schmit, PhD and Karin Goodfriend, MD
- **Summary:** Imaging of brain structure was conducted along with functional outcomes measurements in people with stroke.
 - Brain structural connectivity, measured using indirect connectivity, correlates with functional outcomes measures in people with stroke.
- **Recruitment:** SSRD, 8 participants with stroke.
- **Status:** Open to enrollment.

Giving to the SRC

We are incredibly fortunate to have the support of donors who are passionate about stroke rehabilitation. Advancing research in how the affected limb is sensed is critical to developing rehabilitation tools and practices to increase the independent function and safety for stroke survivors. A generous gift supports this project.

Wearable Technology to Improve Proprioception in Stroke Survivors

- **Principal Investigators:** John McGuire, MD and Robert Scheidt, PhD



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- **Summary:** Changes in proprioception after stroke can result in difficulty sensing where the affected limb is in space, leading to increased risk for injury and decreased function.

“The SRC has allowed my lab to expand its focus from basic science research to translational research on novel technologies that enhance recovery from stroke. With support from the SRC, we are testing a new wearable system that encourages specific exercises designed to mitigate hemipersonal neglect in the days and weeks following stroke. If successful, our research will provide clinicians with a low-cost tool that can facilitate functional recovery and improve patient quality of life.”



Robert Scheidt, PhD
Professor
Biomedical Engineering
Marquette University
SRC Member

- Stroke survivors were engaged to help design a wearable bracelet that used vibration and light to draw attention to the affected limb.

- **Recruitment:** SSRD

- **Status:** Open to enrollment as of October 2019, 2 participants enrolled.

Sharing our research with the academic and clinical community

SRC researchers share results through manuscripts published in peer review journals, conference proceedings at national meetings, and presentations. SRC faculty members also submit competitive, rigorous grants to fund their work through philanthropy, institutional awards, and federal funding.

Publications

Kalinosky BT, Vinehout K, Sotelo MR, **Hyngstrom AS, Schmit BD**. Tasked-Based Functional Brain Connectivity in Multisensory Control of Wrist Movement After Stroke. *Front Neurol*. 2019 Jun 13;10:609. doi: 10.3389/fneur.2019.00609. eCollection 2019. PMID: 31263444

Vinehout K, **Schmit BD, Schindler-Ivens S**. Lower Limb Task-Based Functional Connectivity Is Altered in Stroke. *Brain Connect*. 2019 May;9(4):365-377. doi: 10.1089/brain.2018.0640. Epub 2019 Mar 23.

PMID: 30799641

Durand MJ, Boerger TF, Nguyen JN, Alqahtani SZ, Wright MT, **Schmit BD**, Gutterman DD, **Hyngstrom AS**. Two weeks of ischemic conditioning improves walking speed and reduces neuromuscular fatigability in chronic stroke survivors. *J Appl Physiol* (1985). 2019 Mar 1;126(3):755-763. doi: 10.1152/jappphysiol.00772.2018. Epub 2019 Jan 17. PMID: 30653420



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Murphy SA, Negro F, Farina D, Onushko T, **Durand M**, Hunter SK, **Schmit BD**, **Hynstrom A**. Stroke increases ischemia-related decreases in motor unit discharge rates. *J Neurophysiol*. 2018 Dec 1;120(6):3246-3256. doi: 10.1152/jn.00923.2017. Epub 2018 Oct 31. PMID: 30379629

Cleland BT, Getting T, Arand B, Struhar J, **Schindler-Ivens S**. Impaired interlimb coordination is related to asymmetries during pedaling after stroke. *Clin Neurophysiol*. 2019 Jun 21;130(9):1474-1487. doi: 10.1016/j.clinph.2019.05.025. [Epub ahead of print] PMID: 31288158

Vinehout K, **Schmit BD**, **Schindler-Ivens S**. Lower Limb Task-Based Functional Connectivity Is Altered in Stroke. *Brain Connect*. 2019 May;9(4):365-377. doi: 10.1089/brain.2018.0640. Epub 2019 Mar 23. PMID: 30799641

Cleland BT, **Schindler-Ivens S**. Brain Activation During Passive and Volitional Pedaling After Stroke. *Motor Control*. 2018 Jul 17:1-29. doi: 10.1123/mc.2017-0059. [Epub ahead of print] PMID: 30012052

Abstracts

Schindler-Ivens SM. Scanlon G, Roudebush L, Patel ND, De Lara, K, Carpenter M, Arciga, S. An Evidence Infographic for Knowledge Translation in physical therapy – Description, Development, and Clinician Feedback. Center on Health Services Training and Research (CoHSTAR) Implementation Science Institute, Providence, RI, May 1st – 2nd, 2019.

Rappaport B., **Schindler-Ivens S**. Design of Force Measurement System for Pedaling in MR Environment. Accepted for Presentation at the Annual Meeting of the Rocky Mountain Bioengineering Symposium, April 2019, Milwaukee, WI

Waldera A., **Schindler-Ivens S**. A Novel Therapeutic Intervention to Improve Lower Limb Movement Post-Stroke. NEXT Meeting of the American Physical Therapy Association, June 2019, Chicago, IL

Vinehout, K., **Schindler-Ivens, S.**, Schmit, B.D. Identify Local and Global Functional Connectivity Dependence on Lower Limb Motor Tasks in Stroke Survivors. In: Annual Meeting of the Biomedical Engineering Society; 2018 Oct 17-20; Atlanta, Georgia (GA); BMES; 2018. nr 436.

Schindler-Ivens, S., Schmit, B.D. Vinehout, K. Detection of altered network function after stroke is task-dependent. Annual Meeting of the Society for Neuroscience; 2018 Nov; San Diego, CA.



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Durand, M., Nguyen, J., Wright, MT., Gutterman, DD., **Schmit, BD., Hyngstrom, AS.** Ischemic Conditioning Improves Brachial Artery Flow Mediated Dilation in Chronic Stroke Survivors. International Stroke Conference 2019. Podium Presentation. Stroke. 2019; 50:A60.

Durand, MJ., Nguyen, JN., Wright, MT., Raab, SC., Gutterman, DD., **Schmit, BD., Hyngstrom, AS.** Evaluation of knee extensor muscle strength and femoral artery blood flow in subacute stroke patients admitted to inpatient rehabilitation – a feasibility study. Stroke. 2018; 49:ATP143.

“Facilitating opportunities for stroke survivors and their loved ones to partner with clinicians, researchers, therapists and other stakeholders to partner on cutting edge research is a unique opportunity. Leveraging our combined experience and resources allows us to be much more powerful together.”

Grants Awarded

Title: Ischemic Conditioning and Improved Motor Function Post Stroke

Source: NIH/NICHHD R01HD099340

Principal Investigator(s): Allison Hyngstrom, PT, PhD, Matt Durand, PhD

Dates: 07/01/2019 – 06/30/2024

Direct Funds: \$1,582,448

Title: Ischemic Conditioning and Sympathetic Activation in Chronic Stroke Survivors

Source: CTSI of Southeastern Wisconsin

Principal Investigator: Matt Durand, PhD

Dates: 10/1/2019 – 3/31/2020

Direct funds: \$12,500

Title: Ischemic Conditioning Improves Walking Function Post Stroke

Source: American Heart Association Institutional Research Enhancement Award (AIREA)

Principal Investigator: Allison S. Hyngston, PT, Ph.D.

Dates: 01/01/2019 – 12/31/2020 (Relinquished for R01HD099340 7/8/19)

Direct Funds: \$154,000



Moriah Iverson, MS
Program Manager
SRC Staff

Advancing stroke recovery through training for future clinicians and researchers

The SRC continues to excel in advanced, interdisciplinary training opportunities for residents, fellows, and graduate students.

SRC Spasticity Fellows

2019 saw the graduation of two fellows, Cassandra List, MD and Kimberly Keniry, MD, from the Department of Physical Medicine and Rehabilitation's Spasticity Fellowship Program. Both fellows participated in research projects that received sponsorships from our industry partner Saol, Inc.



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Gait Analysis, Diagnostic Nerve Block

- **Principal Investigator:** John McGuire, MD
- **Fellow:** Cassandra List, MD
- **Summary:** This study will provide objective data to support the use of diagnostic nerve blocks (DNB) to guide use of Onabotulinum toxin A (BoNT) to reduce focal spasticity and improve gait mechanics.
- **Recruitment:** 20 acute and chronic stroke
- **Status:** Open to enrollment

Revised Ashworth-Tardieu Scale (RATS) Reliability Study

- **Principal Investigator:** John McGuire, MD
- **Fellow:** Kimberly Keniry, MD
- **Summary:** The Modified Ashworth Scale/Modified-Modified Ashworth Scale and Modified Tardieu Scale are common clinical measures of spasticity but independently are inadequate in the assessment of spasticity. A lack of inter- and intra-rater reliability studies pose challenges to using these assessments reliably. Combining components of each scale in a standardized method may improve the assessment of the severity of spasticity in order to better guide treatment decisions and monitor outcomes.
- **Recruitment:** 8 stroke survivors
- **Status:** Open to enrollment

SRC Graduate Research Fellow

The 2019 SRC graduate research fellow was Priya Balasubramanian. Priya is a PhD candidate in Biomedical Engineering working with Drs. Schmit and Hyingstrom. Her project examines the changes in brain activity during fatigue in people with stroke. Fatigue can limit training during rehabilitation due to tiredness during exercise, and it interferes with the force demands of everyday activities. Her study uses electroencephalography (EEG) to measure brain activity. She is using EEG to study how connections in the brain are changed after a stroke and how these changes in connections affect fatigue. These changes may limit the ability to adapt to increasing neural demands for neural drive at the onset of fatigue. Knowledge obtained from this study will aid in developing therapies, such as transcranial direct current stimulation or repetitive transcranial magnetic stimulation, that target cortical activation for rehabilitation.



Priya Balasubramanian conducts an experiment in which brain signals are measured while the volunteer contracts their wrist to fatigue.



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Caring for stroke survivors through comprehensive stroke management

Excellence in targeted clinical care continues to grow

Receiving the best clinical care post-stroke is of utmost importance to stroke survivors and their loved ones. Our Comprehensive Stroke Management program ensures that patients and their families have access to the best clinical care based on the latest developments in research and technology. Our caring team of clinicians, nurse practitioners, and clinic staff are dedicated to partnering with patients, their loved ones, and academic researchers to develop a rehabilitation plan that will allow the individual to optimize their function. Our weekly Stroke Clinic provides an opportunity for stroke survivors to receive excellent, coordinated care and access to cutting edge research opportunities.

John McGuire, MD is the Director of the clinical program, and the Co-Director of the SRC. His leadership leverages our program to integrate the latest research directly into clinical care. Faculty members Nick Ketchum, MD, and Erin McGonigle, MD also staff this clinic. Dr. McGonigle completed the SRC Stroke Fellowship in collaboration with researchers in Physical Therapy and Biomedical Engineering at Marquette University and continues to conduct research to optimize functional recovery of stroke related disability. Karin Goodfriend, MD cares for our pediatric population of stroke survivors at Children's Wisconsin, which has a transition program to ease these patients into our adult program.

Increasing access to stroke rehabilitation for veterans

Stroke significantly affects the veteran population, with over 15,000 veterans a year experiencing a stroke. The U.S. Department of Veterans Affairs has made research in stroke a priority, with many teams across the country making advances in this area. Under the leadership of Jen Yacub-Martin, MD, The Department of Physical Medicine and Rehabilitation at the Clement J. Zablocki Veterans Affairs Medical Center (ZVAMC) collaborated with the Department of Physical Therapy to develop an interdisciplinary chronic stroke clinic. The clinic is held on a monthly basis and serves as a screening clinic to identify medical, physical and neurocognitive care needs of the veteran stroke population. During the clinic visit the veteran is evaluated by a PM&R physician, physical therapist, occupational therapist and neuropsychologist. In addition to their evaluations veterans receive educational materials regarding stroke etiology and secondary stroke risk reduction. The main outcome measures tracked by the clinic include the stroke impact scale, Montreal Cognitive Assessment, ADL and IADL performance and mobility measures. Veterans are also screened for depression, falls and need for specialty referrals such as pulmonary referrals for evaluation of sleep apnea. This clinic model prioritizes individualized stroke-related care plans while aiming to identify and address secondary stroke complications to reduce functional and medical decline. The program has been successful in identifying safety issues, need for optimization in medical management, mobility needs, cognitive impairment, tobacco use, sleep and mood disorders.



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Engaging stroke survivors and their loved ones as partners in research

The SRC is dedicated to transforming the lives of people touched by stroke through our clinical care and cutting-edge research. Our purpose is to educate, empower, and engage our community of stroke survivors and their support networks to advance stroke rehabilitation that meets the needs of these individuals. The Community Academic Advisory Board (CAAB) includes clinicians, academic researchers, stroke survivors, individuals who have supported a stroke survivor, and other community stakeholders who see the value and importance of stroke rehabilitation in their communities. In FY2019 the CAAB identified a critical need to elevate stories of hope, resilience and recovery in the stroke survivor community. Our work this year focused on building partnerships that will facilitate work towards this goal.

Elevating stroke survivor voices

As stroke survivorship increases, it is critical to engage the community of stroke survivors and their support networks as partners in research. Recent research has shown that stroke survivors have a high prevalence of perceived unmet long-term needs in bodily function, activity or participation, and environmental needs (Chen et al 2018), and a community-based, peer-led coaching program for stroke survivors has recently shown promise in supporting stroke survivors in community re-engagement, social and leisure activities, demonstrating the importance of engaging stroke survivors as experts in their own recovery (Sadler et al, 2017, Masterson-Algar et al, 2018). Stroke survivors on the CAAB supported this, commenting on how the lack of community during stroke recovery can be isolating and discouraging. Our collaborative process revealed the need to elevate stroke survivor voices to 1) educate clinicians on the perspective of the stroke survivor outside their role as a patient, 2) creating stories of hope and resilience to inspire and educate other stroke survivors, and 3) providing a way to educate the general community about stroke recovery, and enhance agency for stroke survivors in public.

Building capacity to share stories

In research, storytelling is an arts-based method that has been used in several fields to influence health outcomes (reviewed by Rieger et al, 2018). Storytelling through video logs (Vlogs) posted on social media by stroke survivors was shown to support stroke survivors in overcoming speech and motor impairments and to build community (Chen et al 2018). Storytelling is also an age-old way of passing down oral histories, building community, teaching lessons, and cultivating meaning and has been used by cultures across the globe. Sharing stories can seem simple, but sharing an effective story actually takes some practice! The SRC has partnered with Ex Fabula, a local storytelling organization, to facilitate a series of storytelling workshops and coaching opportunities for stroke survivors. Experts in storytelling will support stroke survivors and their loved ones in choosing and developing their recovery story to share at a live storytelling event scheduled for Spring/Summer 2020. Journalist Vianca Fuster will document this journey, resulting in a short film that can be shared with patients, clinicians, students, therapists and the community.



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We are indebted to many for the generous support of the SRC. The SRC is funded in part by the Research and Education Program Fund, a component of the Advancing a Healthier Wisconsin endowment at the Medical College of Wisconsin. Marquette University and the Medical College of Wisconsin provided support for the SRC through the Department of Biomedical Engineering. The Medical College of Wisconsin's Neuroscience Research Center and the Department of Physical Medicine and Rehabilitation provided institutional support. Froedtert Hospital has been a valuable partner as we synergize our clinical care and research capacity.

A generous gift from Nancy Browne and Debra Volger supported research for John McGuire, MD.

We are indebted to our Strategic Planning Committee, Cecilia Hillard, PhD, Shekar Kurpad, MD, Brian-Fred Fitzsimmons, MD, Frank Pintar, PhD, Diane Braza, MD, Brian Schmit, PhD, Allison Hyngstrom, PT, PhD, John McGuire, MD, Matt Durand, PhD, and Anne Jurenc for their guidance and support. We thank the team of faculty, staff, residents, fellows and students who dedicate their lives to excellence in clinical care and research. Many thanks to David Harder, PhD for his guidance.

SRC Leadership Committee

Diane Braza, MD
Chair and Professor, Department of Physical Medicine and Rehabilitation, Medical College of Wisconsin

Jeanne Hossenlopp, PhD
Vice President for Research and Innovation
Marquette University

John McGuire, MD
Professor, Department of Physical Medicine and Rehabilitation, Medical College of Wisconsin
Co-Director, Stroke Rehabilitation Center of Southeastern Wisconsin

Brian Schmit, PhD
Professor, Biomedical Engineering
Marquette University
Co-Director, Stroke Rehabilitation Center of Southeastern Wisconsin

SRC Core Faculty

Allison Hyngstrom, PhD
Chair and Associate Professor, Physical Therapy, Marquette University

Matt Durand, PhD
Assistant Professor, Physical Medicine and Rehabilitation, Medical College of Wisconsin

Sheila Schindler-Ivens
Associate Professor, Physical Therapy, Marquette University

Robert Schiedt, PhD
Professor, Biomedical Engineering, Marquette University

Nick Ketchum, MD
Associate Professor, Physical Medicine and Rehabilitation, Medical College of Wisconsin

Karin Goodfriend, MD
Assistant Professor, Physical Medicine and Rehabilitation, Medical College of Wisconsin

SRC Staff

Moriah Iverson, MS, Program Manager

Rachel Minkin, MS, Clinical Research Coordinator