

September 23, 2021

Wayne State University Medical Alumni Association
Alumni Award Committee
alumni@med.wayne.edu
Dear Committee Members,

It is my pleasure to write this letter of nomination for my classmate, Paul. E. Barkhaus, MD, class of 1975, for the Distinguished Alumni Award. I have known Dr. Barkhaus since we started medical school in 1971, we both became neurologists and have maintained regular contact since then, both on a personal and professional level where I have sought his advice in difficult neuromuscular cases.

I have attached his CV and will highlight and expand on what I believe distinguishes him for this honor. Dr. Barkhaus is a fourth generation native Detroiter, and a second-generation WSU alumnus. His mother graduated from the School of Education and two of his three brothers also attended WSU. He is a graduate of the College of Liberal Arts (BS in Biology) followed by the School of Medicine. In his junior year of medical school, he served as the editor of the school paper (The Synapse) and received the Class' Distinguished Service Award at graduation. Service has been a recurring theme in his career, including pursuit of a career in academic medicine.

Like myself, during medical school Dr. Barkhaus became very interested in the neurosciences. His residency training in neurology was also done at WSU. Despite limited resources, he preferred spending the majority of his time at Detroit General Hospital, serving the underserved, similar to one of his mentors, Dr. William R. Darmody, for whom the Neurointensive Unit at Detroit Receiving Hospital is named. At the completion of his training in neurology, Dr. Barkhaus was accepted for a fellowship in electromyography (EMG) at the University of Minnesota. This was followed by a second fellowship in clinical neuromuscular diseases at the University of Arizona, including a month visit to Uppsala University in Sweden to learn the relatively new technique of single fiber EMG.

His first academic position was at the University of Cincinnati. His first academic project was on Jamaican neuropathy that was an onsite field study that he funded himself in collaboration with the University of the West Indies. As part of this study, Dr. Barkhaus helped set up the EMG laboratory there and trained the only academic neurologist in Jamaica in this procedure. In 1985 he felt he needed more research training in clinical neurophysiology. He then returned to Uppsala University for 6 months, followed by a year at Duke University. This enabled him to embark on a very productive academic career, primarily in clinical neurophysiology. Recently the American Association of Electromyography and Electrodiagnosis awarded him their Distinguished Research Award.

Dr. Barkhaus considered returning to WSU, however the timing was not right as an academic electromyographer had just been hired by the new Chair, so he returned to Minneapolis as faculty at the University of Minnesota, specifically at the Minneapolis Veterans Administration Medical Center (VAMC). He has always been proactive for Veterans (his family has 6 generations who served). In 1993, he took a position at the Medical College of Wisconsin, where he has practiced to the present.

Dr. Barkhaus' 28 years in Milwaukee have been remarkable for his work at the local, national, and international levels. He found that ALS patients were not receiving the care they needed. In partnership with the local ALS Association Chapter, he began a multidisciplinary clinic and program at the academic (Froedtert) and the Milwaukee VAMC. These are both recognized as "gold" level centers for their excellence in clinical care, education, and research. Early research included participation in the Great Lakes ALS Study Group that included collaboration with his alma mater, WSU. In 2009, his ALS clinic was chosen by the VA's lead neurologist to present their models for providing excellent care at a national VA Symposium. As a believer in the team approach, he ensured that every member of his team went, including one of the patients. Dr. Barkhaus also has great interest in palliative care in ALS and has been active in promoting it in his program. Other efforts have included studying children as caregivers for family members with ALS. As one colleague said of him, he is nationally known as a compassionate ALS physician. He belongs to the "ALSUntangled" Group that regularly publishes reviews of complementary and alternative therapies in ALS (over 60 to date). The Wisconsin Chapter of the Paralyzed Veterans of America awarded him a special commendation for his efforts in helping Veterans, particularly those with ALS.

In research, Dr. Barkhaus has made several contributions to the field of clinical neurophysiology (EMG). His most significant achievement was in developing the technique of motor unit index (MUNIX) for tracking motor neuron loss in ALS along with his collaborator, Dr. Sanjeev Nandedkar. Again, he funded this on a shoestring. Despite adversity in acceptance of MUNIX in the US, they were able to form a consortium with colleagues in Europe. Their persistence was rewarded in that it is now a recognized biomarker in ALS clinical trials and has been applied to other disorders. His papers include a number of studies addressing fundamental issues in EMG. As a measure of his work, the 2019 International Federation of Clinical Neurophysiology recommendations for Standards for Quantification of EMG and Neurography contained 14 first authored or co-authored citations by him, making him one of the top cited. Most all current EMG textbooks also cite his work. This reflects the widespread impact of his research.

In the education domain, Dr. Barkhaus has been involved in teaching since medical school. He is a sought-after speaker because of his ability to break down difficult concepts to understandable components. He has been an invited lecturer at the principal neurological and electrophysiological societies, in addition to the annual International Symposium on ALS/Motor Neuron Diseases. He has given talks in Jamaica, Italy, Colombia, India, Japan, Poland, and Mexico. Until suspended by COVID, he was one of two outside invited speakers to the annual Harvard Neuromuscular and EMG Course. Together with his colleague, Dr. Nandedkar, they created the first DVD multi-media books in EMG. He was asked by the editor of the prestigious Handbook of Clinical Neurology to author the first chapter in the volume on clinical neurophysiology. PEB is a regular reviewer for several journals.

In community service, Dr. Barkhaus has donated many hours of lecture and education time to colleagues overseas. In the latter, he has done this without any external support. He is hoping to expand on these activities as part of the American Academy of Neurology's Global Health Section. He has been accepted to be a team physician for the University of Wisconsin's Program (in collaboration with the Department of Defense) to recover the remains of MIAs. He was to go in 2021, but this has been delayed by COVID to 2022. As he transitions into retirement, Dr. Barkhaus has other medical mission trips to third world countries planned with colleagues.

In summary, Dr. Barkhaus has exemplified a long career in academic medicine where his humanitarian efforts have made a significant impact in the quality of life for many hundreds of ALS patients and their families for over two decades in Wisconsin, Illinois, and Michigan. He has also made significant contributions to his subspecialties of neuromuscular medicine and clinical neurophysiology and is an accomplished educator. He continues to be robustly involved in all these areas but will be transitioning to more international educational and clinical activities indirectly providing humanitarian benefits to underserved communities.

I would therefore offer my unqualified recommendation that Dr. Barkhaus be given this honor for his many contributions as well as his continuing love of Wayne State University that has been an essential part of his life. Should you have any further questions, please do not hesitate to contact me.

Sincerely yours,

Robert L. Vollbracht, M.D.

Robert Vollbracht, MD (Class of 1975)
85 Belleview Blvd, Unit 605
Belleair, Florida 33756
727-709-5566
Rvollbr422@aol.com

Lisa Ramos

From: noreply@wayne.edu
Sent: Friday, September 24, 2021 9:14 PM
To: Lisa Ramos
Subject: New submission for: Alumni Award Nomination Form

Nominee:

First name: Paul

Last name: Barkhaus

Email: pbarkhaus@gmail.com

Graduation Year: 1975

Specialty: Neurology - Neuromuscular

Address: 730 E Sylvan Ave
Whitefish Bay, WI
53217-5350

Home Phone: 414-828-2823

Office Phone: 414-955-0619

Nominator:

First Name: Robert

Last Name: Vollbracht

Email: rvollbr422@aol.com

Graduation Year: 1975

Specialty: Neurology

Address: 85 Belleview Blvd
Unit 605
Bellaire, FL
33756

Home Phone: 727-709-5566

Office Phone: 727-443-3295

Select Nominee Award : Distinguished Alumni Award

Submit cover letter explaining why you believe this person should be considered: LOR WSU Alumni Award_Final.docx

Candidate's current CV: PB CurrVitae_Current_WSU.pdf

Please list any other relevant information that the committee may find helpful in reaching its decision, as they receive several qualified applicants each year: Dr. Paul Barkhaus is an outstanding individual with many achievements deserving this award.

IP Address: 35.137.162.188

View submission: <https://forms.wayne.edu/create/form-manage.php?form=6187&id=3320918>

CURRICULUM VITAE

09_2021

Paul E. Barkhaus, M.D.

Professor of Neurology and Physical Medicine and Rehabilitation with Tenure
Director, Neuromuscular and Autonomic Disorders
Director, Amyotrophic Lateral Sclerosis (ALS) Program
Department of Neurology

- (2) **Office Address:** Department of Neurology
Froedtert Memorial Lutheran Hospital
Medical College of Wisconsin
8701 W Watertown Plank Road
Milwaukee, Wisconsin 53226
Phone (414) 955-0607
Fax (414) 955-0127
Email: pbarkhaus@mcw.edu
- (3) **Place of Birth:** Detroit (Wayne County), Michigan
- (4) **Citizenship:** U.S.A.
- (5) **Education:** 1972 B.S. (Biology) Wayne State University, Detroit, Michigan
1975 M.D. Wayne State University, Detroit, Michigan
- (6) **Postgraduate Training and Fellowship Appointments:**
- | | |
|------------------|---|
| 1975-1978 | Resident, Neurology, Wayne State University, Detroit, Michigan |
| 1978-1979 | Fellowship, Electromyography, Department of Neurology, University of Minnesota, Minneapolis, Minnesota |
| 1979-1980 | Clinical Neuromuscular Diseases Fellowship, Department of Neurology, University of Arizona, Tucson, Arizona |
| 1980 (one month) | Single Fiber Electromyography, Uppsala University, Uppsala, Sweden |
| 1986-1987 | Senior Research Fellowship in Electromyography, Duke University Medical Center, Durham, North Carolina |
- (7) **Military Service:** None

(8) Faculty Appointments:

- 1980-1985 Assistant Professor of Neurology
University of Cincinnati, Cincinnati, OH
- 1985-1986 Visiting Scientist
Department of Clinical Neurophysiology
Uppsala University, Uppsala, Sweden
- 1986-1987 Associate in Medicine (Neurology)
Duke University, Durham, North Carolina
- 1987-1993 Assistant Professor of Neurology
University of Minnesota
Minneapolis, Minnesota
- 1993- 2002 Associate Professor of Neurology (Clinical/Educator Track)
Medical College of Wisconsin
Milwaukee, Wisconsin
- 2002-2011 Professor of Neurology (Clinical/Educator Track)
Medical College of Wisconsin
Milwaukee, Wisconsin
- 2011- Professor of Neurology (Clinical/Educator Track) with
Tenure
Medical College of Wisconsin
Milwaukee, WI
- 2012- Professor of Neurology and Physical Medicine &
Rehabilitation (Clinical/Educator Track) with Tenure
Medical College of Wisconsin
Milwaukee, WI

(9) Administrative Appointments:

- 1997- Director, Amyotrophic Lateral Sclerosis (ALS) Program
- This has grown from a small monthly clinic to a weekly multi-disciplinary clinic that serves over 150 ALS patients in eastern Wisconsin, northern Illinois, and the western Upper Peninsula of Michigan (<25 day access for new referrals)
 - The Program is a nationally recognized and certified ALS Center of excellence by the ALS Association [35 Centers total in the USA].
 - The Center has become a source of referrals to the GI Service [largest single referral source for feeding tubes], Pulmonary Medicine, and Palliative Care.

- I am a regular contributor to teaching in the Palliative Care Program and a frequent invited speaker to local and regional hospitals, including U WI Madison.

The Program also conducts active research in the clinical neurophysiology of ALS, genetic studies, and treatment trials [one completed and two slated for late 2010 in partnership with the Northeast ALS Consortium/Harvard].

- The Program has won grants from the Greater Milwaukee Foundation. This Program has national, regional, and local recognition as a destination of choice for patients affected with ALS.
- I was honored by the Wisconsin Chapter of the ALS Association in 2009 by their contribution of educational materials to MCW's Medical library.

2003- Director, ALS Program, Milwaukee VAMC

- This Program was established to serve Veterans with ALS, which is now recognized by the VA as a service-connected condition.
- The Program has a growing census of patients and is the *only* Multi-Disciplinary Clinic for ALS patients in the VA system that meets ALS Association certification criteria.
- The Program is recognized as a front runner in care to ALS patients by the VA Lead Neurologist and I was honored in May 2009 with a Special Commendation by the Wisconsin Chapter of the Paralyzed Veterans of America.

2012- Chief, Neuromuscular Section, Department of Neurology

(10) Educational Administrative Appointments:

Medical College of Wisconsin:

1993- 2004 Director, Medical Student 4 Neurology Elective
Administrative duties plus 10 hr direct teaching/month, including development of a case discussion approach to teaching and a "pocket card" to help summarize the neurological history and examination.

1993-1997 Coordinator, Electromyography Fellowship Program and Residency in Clinical Neurophysiology

- 2000-2013 Director, Clinical Neurophysiology Training Program
- Involves coordinating Fellow rotation and lecture schedules, recruitment of Fellows.
 - Formal & informal feedbacks of my performance have been excellent, including a recent 5 year recertification by the ACGME- the maximum that can be awarded.
 - To date most all Fellows have taken the certifying examination and all have passed
- 2000-2004 Director, Clinical Neurophysiology Course and Co-Director, Basic Neuroscience Course for Neurology Trainees (I was responsible for arranging a 2 year cycle of lectures in the above disciplines including choosing the lecturers and ensuring compliance in attendance plus getting textbooks for these courses. In comparison to previous years the lectures were very well attended, almost no lecturer re-scheduled talks, and in-service exam scores
- 2012-2019 Faculty Advisor, Student Interest Group in Neurology (SIGN)

Previous:

- 1980-1985 Coordinator, Electromyography Fellowship
University of Cincinnati, Cincinnati, Ohio
- 1987-1990 Coordinator, Electromyography Fellowship
Minneapolis Veterans Administration Medical Center

(11) Hospital and Clinic Administrative Appointments:**Department of Neurology/ Medical College of Wisconsin:**

- 1993-2016 Associate Lead/ Chief Neurologist Milwaukee Veterans Administration Medical Center
Several hours/week coordinating outpatient clinics to meet VA patient access requirements and also development of Neurology Telemedicine Program)
- 1993- Director, Electromyography Laboratory and Neuromuscular Diseases Milwaukee Veterans Administration Medical Center
This Lab consistently maintains an 14 day or less access

and serves the basic and specialty needs of the Milwaukee VAMC, and most of the Primary Care Clinics and affiliated Other Medical Centers in VISN 12; all encounters are closed in 24 hours or less.)

- 2008- Promotion & Tenure Committee
- 2011- Section Chief, Neuromuscular & Autonomic Disorders,
Department of Neurology, Medical College of Wisconsin
- 2016- Member, Neurology CME Course Committee
- 2017- Chair, Web Page Committee
- 2012- Promotion & Tenure Committee
- 2018-2019 Chair, Search Committee, Pediatric Neurology Division
Chief

Previous:

- 1980-1985 Director, Electromyography Laboratory and
Neuromuscular Diseases
University of Cincinnati, Cincinnati, Ohio
- 1987-1993 Director, Electromyography Laboratory and
Neuromuscular Diseases
Minneapolis Veterans Administration Medical Center
- 1988-1990 Assistant Chief of Neurology
Minneapolis Veterans Administration Medical Center

(12) Research Administrative Appointments: none

(13) Hospital Staff Privileges:

- 1993- Attending Staff
Froedtert Memorial Lutheran Hospital
- 1993-2016 Staff Physician
(retired) Milwaukee Veterans Administration Medical Center
- 2012- Staff Physician
Children's Hospital of Wisconsin

(14) Specialty Boards and Certification:

Boards

National Board of Medical Examiners	Diplomate	1976
American Board of Psychiatry and Neurology (Doing voluntary MOC)	Diplomate	1980
American Board of Electrodiagnostic Medicine	Diplomate	1989
American Board of Disability Analysts	Senior Examiner	2003

<u>Current State Licensure</u>	<u>Number</u>	<u>Date of Issue</u>
Minnesota	#24561	February 23, 1979
California	#G41740)	April 7, 1980 (inactive)
Wisconsin	#34822	September 23, 1993

(15) Awards and Honors:

1975	Distinguished Service Award Wayne State University School of Medicine
1980	Trainee Award Federation of Western Societies of Neurological Sciences
1982	Special Commendation Cincinnati Chapter, Muscular Dystrophy Association
1987	Alumnus Hall of Fame Allen Park High School, Allen Park, Michigan
1992	Special Commendation Minnesota Chapter, Myasthenia Gravis Foundation
1995	Special Commendation Froedtert Memorial Lutheran Hospital
2000	Distinguished Visitor to USS Harry S. Truman by invitation of Commander, U.S. 2 nd Fleet
2001	Special Commendation, Wisconsin Neurological Society
2002	Clinical Neurophysiology Teacher of the Year Award Department of Neurology, Medical College of Wisconsin
2006-	Designated as "America's Top Physicians", Consumers' Research Council of America
2006-	Selected for "Best Doctors in America" database
2007-	Voted a Southeastern Wisconsin "Best Doctor"

- by Coalition for Health Care, Milwaukee, WI
- 2007 Elected to American Neurological Association
(This is the premier and oldest neurological association in the US: approximately 5% of neurologists are members based on their recognized accomplishments by their peers.)
- 2009 United Health Premium Designation Program:
Awarded "Quality and Efficiency of Care" Status
- 2009 Special Recognition Award from Paralyzed Veterans of America (Wisconsin Chapter)
- 2009 ALS Association, Wisconsin Chapter donated a number of educational materials to Medical College of Wisconsin's Todd Wehr Library in Dr. Barkhaus' honor
- 2010 Clinical Neurophysiology Teacher of the Year Award
Department of Neurology, Medical College of Wisconsin
- 2014 America's Top Doctors (Castle Connolly Medical Ltd)
- 2014 "Extra-Miler Award", Froedtert Hospital (for exemplary service to patients)
- 2015 "Distinguished Researcher Award" for 2015, American Association of Neuromuscular and Electrodiagnostic Medicine
- 2017 Nominee, Thomas L. Smallwood Award for Patient Care Excellence, Froedtert Hospital
- 2017 Earned *Compostela* for completing the *Camino de Santiago* (*Camino Francés*) pilgrimage, 799 km
- 2017- 19 Citation for being among highest scoring providers in patient satisfaction, Froedtert Hospital & Medical College Physicians
- 2018 "Milwaukee's Top Docs", Milwaukee magazine, December 2018 issue (One of only 4 faculty from Department listed).
- 2019 Faculty Service Award, Department of Neurology, MCW ("for extraordinary citizenship, collegiality, and Professionalism")
- 2019 Letter of Commendation for from John R. Raymond, MD, President and CEO, Medical College of Wisconsin.

- | | |
|------|--|
| 2019 | Recognition by MCW for 25 years service |
| 2019 | Selected to be one of 4 judges for best clinical research poster at the 30 th International Symposium on ALS/Motor Neuron Disease, Perth. |
| 2020 | Nominee, Distinguished Service Award, Medical College of Wisconsin |

(16) Memberships in Professional and Honorary Societies:

Elected/ Appointed:

Great Lakes Amyotrophic Lateral Sclerosis Study Group
Northeast ALS Study Group

Member:

American Academy of Neurology (Fellow)

American Association of Neuromuscular and Electrodiagnostic Medicine
(Active Member by Examination and Fellow)

World Federation of Neurology Research Group on Motor Neuron Diseases

Wisconsin Neurological Society

US ALS Research Group

American Neurological Association (by election- see "Honors")

American Clinical Neurophysiology Society

Non-Medical

National Society of the Sons of the American Revolution (2 ancestors)

(17) Editorial or Other Boards:

Editorial Boards

Journal of Clinical Neuromuscular Diseases (2000-2019)

Associate CME Editor, in Lorenzo NY, Lutsep HL (senior eds):
eMedicine: Journal (Neurology) [serial online]. 2000. Available at
<http://www.emedicine.com>

Section Editor, in Lorenzo NY, Lutsep HL (senior eds): eMedicine: Journal (Neurology) [serial online]. 2000. Available at <http://www.emedicine.com>

Ad Hoc Reviewer (Journal Papers or Grants)

RRNMF Journal (online)

Muscle and Nerve

Journal of Ophthalmic & Plastic Reconstructive Surgery

Journal of Clinical Neurophysiology

Journal of Neurological Engineering

American Journal of the Medical Sciences

Clinical Neurophysiology

Educational Materials, American Assoc of Electrodiagnostic Medicine

Merit Review, Veterans Administration Research Service (Western Division)

Grant Reviewer, Workers Compensation Board, Province of Alberta, Canada

Grant Reviewer, Natural Sciences and Engineering Research Council of Canada

External Reviewer, National Institutes of Health, Dept of Health and Human Services

Abstracts for Annual Meeting, American Neurological Association

Practice Guideline for Management of ALS (American Academy of Neurology)

Grant Reviewer, Medical Research Council, UK

Invited Book Reviewer, Oxford Press

(18) Local/Regional Appointed Leadership and Committee Positions:

1993	Wisconsin Neurological Society (Secretary)
1996	Wisconsin Neurological Society (Treasurer)
1997	State and Regional Monitor for practice issues in electromyography (American Association of Electrodiagnostic Medicine)
1998-2001	Wisconsin Neurological Society
	1998-1999 Vice President
	2000-2001 President
	2000 Convener, Annual Meeting
	2001 Convener, Annual Meeting

2002- Board Member
 2007-2008 Invited by American Association of Neuromuscular and Electrodiagnostic Medicine to testify as an expert at the Health Care Committees in the Wisconsin Assembly and Wisconsin Senate in Madison, WI

(19) National Elected/Appointed Leadership and Committee Positions:

1988 Examiner and Site Organizer. Part II Oral Boards, American Board of Psychiatry and Neurology

1990- Examiner, American Board of Electrodiagnostic Medicine

1990-1992 Constitution Committee, American Association of Electrodiagnostic Medicine

1993-1996 Membership Committee, American Association of Electrodiagnostic Medicine

1996-2008 Examiner, Part II Oral Boards, American Board of Psychiatry and Neurology

1997-2000 Professional Practice Committee, American Association of Electrodiagnostic Medicine

2001-2004 Education Committee, American Association of Electrodiagnostic Medicine

2001-2007 Member, Examination Committee, American Board of Electrodiagnostic Medicine, Chair of Waveform Section

2005-2006 Member, Website Committee, American Association of Neuromuscular and Electrodiagnostic Medicine

2004-2009 Member, Task Force of Quantitative Electromyography

2011-2014 Member, Practice Issues Review Panel, American Assoc of Neuromuscular & Electrodiagnostic Medicine

2014- Member, VA National ALS Executive Committee for the care of Veterans with ALS

2014- State Liaison, American Assoc of Neuromuscular & Electrodiagnostic Medicine

2016- Member, National Medical Advisory Board, ALS Association

2019-2020 Member, Maintenance of Certification/Examination Committee, American Clinical Neurophysiological Society

2021- Appointed as representative of American Association of Neuromuscular and Electrodiagnostic Medicine to DICOM

(Digital Imaging and Communications in Medicine)

(20) Research Grants, Contracts, Awards, Projects:**A. Active****Peer Review**

Title: Non-Invasive Examination of Amyotrophic Lateral Sclerosis Using Surface EMG
 Source: National Institute on Disability and Rehabilitation Research (NIDRR)
 Role: Co-PI; Ping Zhou, PhD (PI) Northwestern University
 Dates: 2010-213
 Direct Funds: 5% Salary Support

Title: Phase II selection trial at high dose creatine and two doses of tamoxifen in patients with ALS
 Source: ALS Therapy Alliance
 Role: Co-PI (PI: Nazem Atassi, MD, Harvard)
 Dates: 2010-2012
 Direct Funds: \$4,370/patient enrolled (estimate 6-8 patients)

Title: Systematic analysis of molecular pathways implicated in amyotrophic lateral sclerosis
 Source: Advancing a Healthier Wisconsin
 Role: Collaborator/Clinical Investigator
 Dates: July 1, 2015- present
 Funds: \$200,000

Title: High-Density surface EMG based CMAP Scan for motor unit estimation
 Source: NIH
 Role: Local PI
 Dates: Submitted
 Funds: \$9,600

Non-Peer Review

Title: Clinical Research in ALS
 Source: Greater Milwaukee Foundation
 Role: PI
 Dates: 2009
 Direct Funds: \$ 19,000

Title: Clinical Research in ALS
 Source: Greater Milwaukee Foundation
 Role: PI
 Dates: 2009-2012
 Direct Funds: \$ 15,000 (per year)

- Title:** Cost Assessment of Care of ALS Patients in a Multi-Disciplinary Clinic
Source: ALS Association
Role: PI
Dates: August 2012 – December 2012
Direct Funds: \$2,000 direct costs/study
- Title:** A Phase IIb, Multi-National, Double-Blind, Randomized, Placebo-Controlled Study to Evaluate the Safety, Tolerability and Efficacy of CK-2017357 in Patients with Amyotrophic Lateral Sclerosis (ALS BENEFIT Study)
Source: Cytokinetics
Role: PI
Dates: Jan 2013 – Jan 2016
Direct Funds: \$13,695 per patient / (10-15 enrollment expected)
- Title:** A Phase 3, Multi-National, Double-Blind, Randomized, Placebo-Controlled, Stratified, Parallel Group Study to Evaluate the Safety, Tolerability and Effect of Tirasemtiv in Patients with Amyotrophic Lateral Sclerosis (ALS)
Sponsor: Cytokinetics
Direct Funds: \$15,290.00/subject (expect 10 subjects)
Role: Barkhaus PE (Local PI)
Dates: 2015-
- Title:** Cross-Sectional ALS Biofluid Biomarker (CABB) Study
Sponsor: ALS Association and the ALS Finding a Cure Foundation as a part of the ALS Accelerate Therapies (ALS ACT) Funding Initiative
Direct Funds: \$540.00/subject
Role: Barkhaus PE (Local PI)
Dates: Fall 2015-
- Title:** A Phase 3, Open-Label Extension Study of Tirasemtiv for Patients with Amyotrophic Lateral Sclerosis (ALS) Who Completed VITALITY-ALS (CY 4031)
Sponsor: Cytokinetics
Direct Funds: \$9,162.50/subject
Role: Co-PI
Dates: 2017-
- Title:** A Multicenter, Double Blind, Placebo Controlled Study to Assess the Efficacy and Safety of H.P. Acthar Gel in the Treatment of Subjects with Amyotrophic Lateral Sclerosis
Sponsor: Mallinckrodt ARD, Inc
Direct Funds: \$14,591.25/subject
Role: Co-PI

Dates: 2017-

Title: CY 5022: A PHASE 2, MULTI-CENTER, DOUBLE-BLIND, RANDOMIZED, DOSE-RANGING, PLACEBO-CONTROLLED STUDY TO EVALUATE THE EFFICACY, SAFETY, AND TOLERABILITY OF CK-2127107 IN PATIENTS WITH AMYOTROPHIC LATERAL SCLEROSIS (ALS)

Sponsor: Cytokinetics
 Direct Funds: \$10,043.75/subject
 Role: Co-PI
 Dates: 2017-

Title: FLX-787-203: A Randomized, Double-Blind, Controlled, Parallel Group Study to Evaluate the Efficacy and Safety of FLX-787-ODT for Treatment of Muscle Cramps in Adult Subjects with Motor Neuron Disease

Sponsor: Flex Pharma, Inc.
 Direct Funds: \$7,702.50/subject
 Role: Co-PI
 Dates: 2017-

Title: IVIg in Post Polio
 Sponsor: Grifols
 Direct Funds: \$37,280/ patient
 Role: Co-PI
 Dates: 2019-

Active Protocols:

The below are unfunded but active research protocols that have appropriate IRB and institutional approval and are done as a PI or as a Co-investigator

Title: A Multi-Center, Validation Study of the ALS Specific Quality of Life- Short Form Instrument (ALSSQOL-SF)

Role: Co-PI
 Dates: 2014-
 Direct Funds: None

1995-present Electroneuromyographic Research
 This covers research related patient studies at MCW and VAMC has yielded >12 peer-reviewed publications authored or co-authored by Dr. Barkhaus.

B. Pending
Peer Review

Non-Peer Review

None

C. PriorPeer Review

Title: Fellowship
 Source: Muscular Dystrophy Association of America
 Role: Clinical Research Fellow
 Dates: 1979-1980
 Direct Funds: \$ 18,000

Title: "Measuring the interobserver reliability and validity between different medical institutions of MVIC and MMT in assessing progression of ALS"
 Source: ALS Association SE Wisconsin Chapter
 Role: Local Principal Investigator (Great Lakes ALS Study Group)
 Dates: 1998-2001
 Direct Funds: \$ 17,800

Title: "Measuring the interobserver reliability and validity between different medical institutions of MVIC and MMT in assessing progression of ALS" Measuring Progression Rate in ALS
 Source: ALS Association of America
 Role: Local Principal Investigator (Great Lakes ALS Study Group)
 Dates: 1998-2001
 Direct Funds: \$ 6,800 (MCW)

Title: A Phase III Trial of Insulin-like Growth Factor-1 (IGF-1) in Patients with Amyotrophic Lateral Sclerosis (ALS)
 Source: NIH (IND# RO1 NS 42759-01)
 Role: Co-investigator (Great Lakes ALS Study Group)
 Dates: 2001-2004
 Direct Funds: \$ 137,500 (MCW)

Title: ALS Research Group for Repository DNA Banking to Facilitate Research in Motor Neuron Diseases
 Source: NIH (IND# RO1 NS 42759-01) [Supplemental Grant]
 Role: Co-investigator (Great Lakes ALS Study Group/ALS Research Group)
 Dates: 2006
 Direct Funds: \$ 9,000 (MCW)

Title: Patients with ALS Survey (PALS)
 Sponsor: University of Kansas Medical Center (KUMC)
 Source: Great Plains Collaborative (GPC) using funds from the Patient-Centered Outcomes Research Institute (PCORI)

Role: Sub-Investigator
 Dates: August 2014-18

Non-Peer Review

None

(21) Invited Lectures/Workshops/Site Visits:

A. International

Date: 1980
 Title: Invited Consultant
 Meeting/Event: Set up electromyography laboratory
 Location: University of the West Indies, Kingston, Jamaica

Date: 1980
 Title: Visiting Instructor in Neuromuscular Diseases
 Meeting/Event: Series of Lectures and Ward Rounds to Registrars in Medicine (2 weeks)
 Location: Department of Medicine, University of the West Indies, Kingston, Jamaica

Date: 1984
 Title: Visiting Instructor in Neuromuscular Diseases
 Meeting/Event: Series of Lectures and Ward Rounds to Registrars in Medicine (2 weeks)
 Location: Department of Medicine, University of the West Indies, Kingston, Jamaica

Date: February, 1986
 Title: Studies in Jamaican Neuropathy
 Meeting/Event: Grand Rounds, Department of Neurology, Warsaw Medical Academy
 Location: Warsaw, Poland

Date: June, 1993
 Title: Invited Chair (Poster Session)/ Discussant
 Meeting/Event: 5th International Conference on Computerized and Quantitative EMG
 Location: Hamilton, Ontario

Date: November, 2005
 Title: The Electrophysiologic Biopsy
 Meeting/Event: Neurology Grand Rounds, University of Milano
 Location: Milano, Italy

Date: November, 2006
 Title: Quantitative EMG

Meeting/Event: Invited Lecture, Neurological Institute, Kyushu University
 Location: Fukuoka, Japan

Date: February, 2007
 Titles: The Electrophysiologic Biopsy, EMG Waveforms, & Amyotrophic Lateral Sclerosis: Overview (3 talks)

Meeting/Event: Neuromuscular Conference, Department of Neurology,
 GB Pant Hospital & Maulana Azad Medical College
 Location: New Delhi, India

Date: May 2009
 Title: Serial MUNIX Studies in ALS
 Meeting/Event: Xth Quantitative EMG Conference
 Location: Venice, Italy

Date: February, 2013
 Titles: Sensory Nerve Conductions; Testing of the neuromuscular Junction; and Palliative Care in ALS Patients (3 talks) + 3 workshops on various clinical neurophysiological techniques
 Meeting/Event: Neuromuscular Conference, Department of Neurology,
 GB Pant Hospital & Maulana Azad Medical College
 Location: New Delhi, India

Date: February, 2015
 Titles: Motor Unit Remodeling: Median Nerve; Lumbar Plexus; plus 4 workshops on various clinical neurophysiological techniques
 Meeting/Event: Neuromuscular Conference, Department of Neurology,
 GB Pant Hospital & Maulana Azad Medical College
 Location: New Delhi, India

Date: February, 2017
 Titles: Electrophysiology of ALS, Case Studies, Estimation of Motor Units; plus 4 workshops on various clinical neurophysiological techniques
 Meeting/Event: Neuromuscular Conference, Department of Neurology,
 GB Pant Hospital & Maulana Azad Medical College
 Location: New Delhi, India

Date: August 2017
 Titles: Motor Unit Remodeling; Motor Unit Estimation, Evaluation and Testing of neuromuscular Transmission, Clinical Neurophysiology of ALS; plus a workshop in Quantitative EMG plus 4 workshops on various clinical neurophysiological techniques
 Meeting/Event: *Auxiliares de Diagnóstico en las Patologías mas*

Frecuentes en la Práctica Clínica, Una Atención con Calidad.

Location: Mexico City, Mexico

Date: April, 2021

Titles: Clinical neurophysiological assessment of Motor Neuron Disease (MND): A practical approach

Meeting/Event: Natus Training Academy (eSeminar-International)
Location: Middleton, WI (Remote)

Date: June 10-12, 2021

Titles: * Anatomy & Physiology of the Compound Motor Action potential (CMAP)
* Motor Unit Number Estimation (MUNE) Techniques Past & Present

Meeting/Event: * Clinical Neurophysiology of ALS
* Workshop: Motor Unit Potential Quantitation
4th Congreso Nacional de Electrodiagnostico y Enfermedades Neuromusculares

Location: Baranquilla, Colombia (Remote)

Date: October 7-9, 2021

Titles: * Aspectos Arcanos de Actividad Espontánea
* Existe Electromiografía de Fibra Única?

Meeting/Event: XXX Congeso Colombiano de Medicina Fisica y Rehabilitación

Location: Baranquilla, Colombia (Remote)

B. National:

Date: 1988

Title: Invited Consultant to TECA Corporation

Meeting/Event: Testing of disposable concentric needles

Location: Minneapolis, MN

Date: 1997

Title: Electromyographic Studies in Inclusion Body Myositis

Meeting/Event: Seminar, Department of Neurology, Ohio State University

Location: Columbus, OH

Date: 1997

Title: Spike Density in the Motor Unit Action Potential

Meeting/Event: Single Fiber EMG Special Interest Group, American

Association of Electrodiagnostic Medicine Annual Meeting

Location: San Diego, CA

Date: 1997
Title: Invited Consultant
Meeting/Event: Set up quantitative EMG recording system, Department of Neurology, Ohio State University
Location: Columbus, OH

Date: 2000
Title: Concentric Versus Monopolar Needle Electrodes: Are They Different?
Meeting/Event: Seminar, Annual Meeting of American Association of Electrodiagnostic Medicine
Location: Philadelphia, PA

Date: January, 2002
Title: Needle electrode EMG examination techniques (Seminar)
Meeting/Event: Department of Neurology, University of Arizona
Location: Tucson, AZ

Date: September 2008
Title: Serial MUNIX Studies in ALS
Meeting/Event: Motor Unit Physiology SIG Group, Annual Meeting of American Association of Electrodiagnostic Medicine
Location: Providence, RI

Date: September 2012
Title: Motor Unit Number Estimation: New Approaches
Meeting/Event: Motor Unit Physiology SIG Group, Annual Meeting of American Association of Electrodiagnostic Medicine
Location: Orlando, FL

Date: October 2013
Title: Palliative Care in ALS
Meeting/Event: Grand Rounds, Department of Neurology, University of Southern Illinois
Location: Springfield, IL

Date: March 2014
Title: Remodeling of the Motor Unit & Neuromuscular Junction Testing
Meeting/Event: EMG Update 2014 (CME Course)
Location: Pittsburgh, PA

Date: May 2014
Title: Principles of Palliative Care in ALS & Neurodegenerative Diseases
Meeting/Event: Grand Rounds, Dept of Neurology, Indiana University
Location: Indianapolis, IN

Date: February 2015
 Title: Basic Motor Conduction Techniques and Current Concepts in Quantitative Electromyography
 Meeting/Event: Annual Meeting, American Clinical Neurophysiology Soc
 Location: Houston, TX

Date: October 2015
 Title: Introduction to the Needle Electrode Examination
 Meeting/Event: Annual Meeting of American Association of Electrodiagnostic Medicine
 Location: Honolulu, Hawaii

Date: December 2019
 Title: "The Great War" (1914-1918) Centennial and Its Legacy in Neurology, Neurosurgery, & Neuroscience (Part I)
 Meeting/Event: Neurology Grand Rounds
 Location: University of Kansas, Kansas City, KS

Date: January 2020
 Title: "The Great War" (1914-1918) Centennial and Its Legacy in Neurology, Neurosurgery, & Neuroscience (Part II)
 Meeting/Event: Neurology Grand Rounds
 Location: University of Kansas, Kansas City, KS

C. Regional:

Date: September, 1999
 Title: Quantitative Muscle Strength Testing
 Meeting/Event: Symposium on ALS
 Location: Milwaukee, WI

Date: October, 2000
 Title: EMG Waveform Recognition
 Meeting/Event: Annual Meeting, Wisconsin Neurological Society
 Location: Green Lake, WI

Date: June, 2000
 Title: Quantitative Electromyography
 Meeting/Event: CME Course on EMG (Department PMR, MCW)
 Location: Milwaukee, WI

Date: October, 2001- 2011
 Title: EMG Waveform Recognition and Case Studies
 Meeting/Event: Annual Meeting, Wisconsin Neurological Society
 Location: Wisconsin Dells, WI

Date: July, 2004 and 2008

Title: Amyotrophic Lateral Sclerosis
 Meeting/Event: Neuroscience of Northeast Wisconsin
 Location: Neenah, WI

Date: February, 2010
 Title: Update in Amyotrophic Lateral Sclerosis
 Meeting/Event: Neurology Grand Rounds, Department of Neurology,
 University of Wisconsin
 Location: Madison, WI

Date: May 13, 2010
 Title: Discussion of ALS
 Meeting/Event: Presentation for broadcast on Channel WKOW, Madison
 Location: Milwaukee, WI

Date: October, 2013
 Title: Palliative Care in Management of Chronic Neurologic
 Disorders
 Meeting/Event: Annual Meeting, Wisconsin Neurological Society
 Location: Peewaukee, WI

D. Local:

Date: December, 2004- present
 Title: Palliative Care "Core Series Lecture" in Amyotrophic
 Lateral Sclerosis
 Meeting/Event: Didactic lecture Series for Trainees (Annual)
 Location: Department of Oncology, Palliative Care Division

Date: October 2008
 Title: Amyotrophic Lateral Sclerosis
 Meeting/Event: Annual Meeting, WI Society of Electrodiagnostic
 Technologists
 Location: Milwaukee, WI

Date: December 2008
 Title: Amyotrophic Lateral Sclerosis
 Meeting/Event: Pulmonary Laboratory Staff, FMLH
 Location: Milwaukee, WI

Date: April 2009
 Title: Overview of Amyotrophic Lateral Sclerosis
 Meeting/Event: Grand Rounds, St. Mary's Hospital
 Location: Milwaukee, WI

Date: June 2009

Title: Amyotrophic Lateral Sclerosis
Meeting/Event: Grand Rounds, Columbia Hospital
Location: Milwaukee, WI

Date: August 2009
Title: Management in Amyotrophic Lateral Sclerosis
Meeting/Event: Grand Rounds, St. Mary's Hospital Ozaukee
Location: Mequon, WI

Date: June 2010
Title: The informed consent process
Meeting/Event: Human Research Professionals Monthly Meeting
Location: Milwaukee, WI

Date: January 2012
Title: "On clinical dealings with Homo sapiens: a multi-media
Soiree of pensées and ribaldry"
Meeting/Event: NICU Journal Club, Dept Neurology, MCW
Location: Milwaukee, WI

Date: February 2012
Title: The human motor unit in health and disease
Meeting/Event: Physical Therapy Postgraduate Program, Marquette Univ
Location: Milwaukee, WI

Date: June 2012
Title: Overview on Amyotrophic Lateral Sclerosis
Meeting/Event: Dept of Physical Medicine and Rehabilitation, MCW
Location: Milwaukee, WI

Date: May, 2013
Title: Old Polio: Diagnosis and Management
Meeting/Event: Grand Rounds, Columbia-St. Mary's Hospital
Location: Milwaukee, WI

Date: March 2014
Title: Introduction to Neuromuscular Disease in Sports Medicine
Medicine
Meeting/Event: Sports Medicine Symposium, Medical College of WI
Location: Milwaukee, WI

Date: April 2014
Title: The Median Nerve: Anatomy and Clinical
Neurophysiology
Meeting/Event: Annual Meeting, WI Society of Electrodiagnostic
Technologists
Location: Brookfield, WI

Date: May 2014
 Title: Current Concepts in Amyotrophic Lateral Sclerosis
 Meeting/Event: Symposium for Senior Physicians
 Location: Medical College of WI

Date: November 2014
 Title: Clinical Concepts in Amyotrophic Lateral Sclerosis
 Meeting/Event: Research Symposium (Neuroscience Center)
 Location: Medical College of WI

Date: April 2015
 Title: Current Concepts in Amyotrophic Lateral Sclerosis
 Meeting/Event: Grand Rounds, Department of Psychiatry
 Location: Medical College of WI

Date: April 2015
 Title: Clinical Correlations in Motor Disorders
 Meeting/Event: M1 Neuroscience Unit
 Location: Medical College of WI

Date: September 2018
 Title: "The Great War" (1914-1918) Centennial and Its Legacy in
 Neurology, Neurosurgery, & Neuroscience (Part I)
 Meeting/Event: Neurology Grand Rounds
 Location: Medical College of WI

Date: November 2018
 Title: "The Great War" (1914-1918) Centennial and Its Legacy in
 Neurology, Neurosurgery, & Neuroscience (Part II)
 Meeting/Event: Neurology Grand Rounds
 Location: Medical College of WI

Date: November 2019
 Title: "23 and We": A History of the MCW Neurology
 Department
 Meeting/Event: Neurology Grand Rounds
 Location: Medical College of WI

Date: April-May, 2020 (total 6 hours)
 Title: The Neurological Examination
 Meeting/Event: M2 Bench-to-Bedside Clinical Skills Workshop (10 hours)
 Location: Medical College of WI

Date: January-May, 2021 (24 hours total)
 Title: The Neurological Examination
 Meeting/Event: M2 Bench-to-Bedside Clinical Skills Workshop (10 hours)
 Location: Medical College of WI

Date: April 28, 2021

Title: EMG Case Studies
 Meeting/Event: Didactic Program, Dept Physical Medicine & Rehab
 Location: Medical College of WI

Date: May 10, 2021
 Title: ALS Overview
 Meeting/Event: MCW Student Interest Group in Neurology (SIGN)
 Location: Medical College of WI, Milwaukee

(22) Peer Reviewed Workshops/Presentations:

A. International:

Date: 1990
 Title: Estimation of motor units in the extensor digitorum brevis muscle
 Meeting/Event: 2nd International Symposium on Computerized and Quantitative EMG
 Location: Mainz, Germany

Date: 1990
 Title: Quantitative EMG in inclusion body myositis
 Meeting/Event: International Symposium on Neuromuscular Diseases
 Location: Munich, Germany

Date: 1992
 Title: Phase interaction in the compound muscle action potential: Application to motor unit estimates
 Meeting/Event: IEEE, Institution of Electrical Engineers
 Place: Savoy Place, London, England

Date: 1993
 Title: Recording territory of the surface electrode
 Meeting/Event: 5th International Conference on Computerized and Quantitative EMG
 Location: Hamilton, Ontario, Canada

Date: October, 1995
 Title: The influence of recording electrode size on CMAP
 Meeting/Event: Annual Meeting, American Association of Electrodiagnostic Medicine
 Location: Montreal, Canada

Date: October, 1995
 Title: Is the rise time criterion too restrictive
 Meeting/Event: Annual Meeting, American Association of

Location: Electrodiagnostic Medicine
Montreal, Canada

Date: October, 1995
Title: Quantitative MUAP analysis in paraspinal muscles
Meeting/Event: Annual Meeting, American Association of
Electrodiagnostic Medicine
Location: Montreal, Canada

Date: November, 2003
Title: Progression in motor unit loss in ALS as studied using
motor unit number index (MUNIX)
Meeting/Event: 14th International Symposium on ALS and Motor Neuron
Disorders
Location: Milano, Italy

Date: November, 2005
Title: The surface interference pattern- index measurement in
ALS
Meeting/Event: 16th International Symposium on ALS and Motor Neuron
Disorders
Location: Dublin, Ireland

Date: November 2008
Title: Laparoscopic placement of gastrostomy feeding tube
(LSCG-tube): Initial experience
Meeting/Event: 19th International Symposium on ALS/MND
Location: Birmingham, England

Date: December 2009
Title: Motor unit number estimate (MUNE) using surface EMG
Interference pattern (S-EMG IP) and compound muscle
action potential (CMAP)
Meeting/Event: 20th International Symposium on ALS/MND
Location: Berlin, Germany

Date: December 2012
Title: MUNIX Studies in the Biceps Muscle in ALS
Meeting/Event: 23rd Internat Symp on ALS/Motor Neuron Diseases
Location: Chicago, IL

Date: December 2012
Title: End of Life Care of ALS Patients in a Multi-Disciplinary
Clinic
Meeting/Event: 23rd Internat Symp on ALS/Motor Neuron Diseases
Location: Chicago, IL

B. National:

Date: 1987
 Title: Computer-aided EMG findings in inflammatory myopathy
 Meeting/Event: Annual meeting, American Association of
 Electrodiagnostic Medicine
 Location: San Antonio, TX

Date: 1989
 Title: Update in Electromyography (2 lectures)
 Meeting/Event: CME Course, Department of Neurology, Indiana School of
 Medicine
 Location: Indianapolis, IN

Date: 1992
 Title: Phase interaction model for motor unit estimates
 Meeting/Event: Annual Meeting, American Association of
 Electrodiagnostic Medicine
 Location: Charleston, SC

Date: 1993
 Title: Motor unit action potential analysis using decomposition
 algorithm
 Meeting/Event: Annual Meeting, American Association of
 Electrodiagnostic Medicine
 Location: New Orleans, LA

Date: 1993
 Title: Clinical evaluation of a decomposition algorithm for
 Motor unit action potential analysis
 Meeting/Event: Annual Meeting, American Association of
 Electrodiagnostic Medicine
 Location: New Orleans, LA

Date: 1993 to present (2-3 sessions/ year: each invitation to return
 is carefully based on evaluations by Attendees and
 Workshop Committee Members)
 Title: Workshop on "Motor Unit Action Potential Quantitation"
 (Dr. Barkhaus developed workshop format and materials)
 Meeting/Event: American Association of Neuromuscular and
 Electrodiagnostic Medicine, Annual Meeting
 Location: Numerous locations nationally and in Canada

Date: 1994
 Title: Interference pattern analysis by length and root mean
 Square analysis
 Meeting/Event: Annual Meeting, American Association of

Location: Electrodiagnostic Medicine
San Francisco, CA

Date: 1994
Title: Motor unit action potential analysis by length and root mean square
Meeting/Event: Annual Meeting, American Association of Electrodiagnostic Medicine
Location: San Francisco, CA

Date: 1996
Title: Spike density: a new feature of the motor unit action potential
Meeting/Event: Annual Meeting, American Association of Electrodiagnostic Medicine
Location: Minneapolis, MN

Date: 1996
Title: Motor unit action potential characteristics affecting the compound motor unit action potential
Meeting/Event: Annual Meeting, American Association of Electrodiagnostic Medicine
Location: Minneapolis, MN

Date: 1996
Title: Surface electrode geometry influences compound muscle action potential size
Meeting/Event: Annual Meeting, American Association of Electrodiagnostic Medicine
Location: Minneapolis, MN

Date: 1997
Title: Quantitative electromyography studies in sporadic inclusion body myositis
Meeting/Event: Annual Meeting, American Association of Electrodiagnostic Medicine
Location: San Diego, CA

Date: 1997
Title: Quantitative motor unit action potential analysis of the laryngeal muscles
Meeting/Event: Annual Meeting, American Association of Electrodiagnostic Medicine
Location: San Diego, CA

Date: 1998
Title: Facial and standard concentric needle electrodes are not interchangeable
Meeting/Event: Annual Meeting, American Association of

Location: Electrodiagnostic Medicine
Orlando, FL

Date: 1998
Title: Serial quantitate EMG in sporadic inclusion body myositis
Meeting/Event: Annual Meeting, American Association of
Electrodiagnostic Medicine
Location: Orlando, FL

Date: 1998
Title: Electrodiagnostic evaluation of the patient with suspected
myopathy, in CME Course, "The Young, the Old, and the
Weak"
Meeting/Event: American Association of Electrodiagnostic Medicine,
Annual Meeting
Location: Orlando, FL

Date: 1999
Title: Unusual Diagnostic and Management Problems in
Neuromuscular Diseases
Meeting/Event: After Dinner Seminar, Annual Meeting, American
Academy of Neurology
Location: Toronto, Canada

Date: 2000
Title: Unusual Diagnostic and Management Problems in
Neuromuscular Diseases
Meeting/Event: After Dinner Seminar, Annual Meeting, American
Academy of Neurology
Location: San Diego, CA

Date: 2003
Title: Serial motor unit index (MUNIX) studies in ALS patients
Meeting/Event: Annual Meeting, American Association of
Electrodiagnostic Medicine
Location: San Francisco, CA

Date: November, 2004
Title: Comparison of two methods (MUNE and MUNIX) to study
The number of motor units in ALS patients and normal
controls
Meeting/Event: International Symposium on ALS and Motor Neuron
Disorders
Location: Philadelphia, PA

Date: 2005
Title: Tibial motor conduction study: contribution of CMAP
reference electrode
Meeting/Event: Annual Meeting, American Association of

Location: Electrodiagnostic Medicine
 Monterey, CA

Date: 2006
 Title: Contribution of sensory nerve fibers in mixed palmar
 Nerve stimulation

Meeting/Event: Annual Meeting, American Association of
 Electrodiagnostic Medicine
 Location: Washington DC

Date: April 2007-2013
 Title: Basic EMG Skills Workshop: Needle Electrode
 Examination (4 sessions/meeting)

Meeting/Event: Annual Meeting, American Academy of Neurology
 Locations: Boston; Seattle, San Diego, Toronto

Date: 2008
 Title: Compound muscle action potential drop at knee stimulation
 In tibial motor conduction study

Meeting/Event: Annual Meeting, American Association of
 Electrodiagnostic Medicine
 Location: Providence, RI

Date: 2011
 Title: Best Practices Associated with the Care and Management
 Of patients with ALS

Meeting/Event: National Meeting, VA Employee Education System
 Location: Cleveland, OH

Date: 2011
 Title: Motor Conductions and F waves, Repetitive Motor Nerve
 Stimulation, plus Workshops on Nerve Conductions,
 and Quantitative EMG

Meeting/Event: Harvard University Course on EMG & Neuromuscular
 Diseases
 Location: Boston, MA

Date: 2011-present
 Title: Motor Conductions and F waves, Repetitive Motor Nerve
 Stimulation, Sensory Nerve Conductions, plus Workshops
 on Nerve Conductions, Motor Unit Number Estimation,
 and Quantitative EMG

Meeting/Event: Harvard University Course on EMG & Neuromuscular
 Diseases
 Location: Boston, MA

Date: October, 2013
 Title: Phase 2 Selection Trial of High Dosage Creatine and Two
 Dosages of tamoxifen in ALS

Meeting/Event: Annual Meeting, Northeast ALS Consortium (NEALS)
Location: Clearwater, FL

Date: October, 2013
Title: The Median Nerve: A schematic approach with clinical neurophysiologic pitfalls and myths. In AANEM Course: A basic Approach to Common Upper Extremity Mononeuropathies and Brachial Plexopathies.

Meeting/Event: Annual Meeting, American Association of Electrodiagnostic Medicine
Location: San Antonio, TX

Date: March, 2013 & April, 2014
Title: Voluntary EMG Activity (part of Course on EMG)
Meeting/Event: Annual Meeting, American Academy of Neurology
Location: San Diego, CA

Date: April 2014
Title: The Lumbar Plexus, Femoral Nerve, & Obturator Nerve: A schematic approach with clinical neurophysiologic pitfalls and sample case studies. In AANEM Course: A basic Approach to Common Lower Extremity Mononeuropathies and Brachial Plexopathies.

Meeting/Event: Annual Meeting, American Association of Electrodiagnostic Medicine
Location: Savannah, GA

Date: February, 2015
Title: Overview of Quantitative EMG
Meeting/Event: Annual Meeting, American Society of Clinical Neurophysiology
Location: Houston, TX

Date: February, 2015
Title: Basic Electromyography
Meeting/Event: Annual Meeting, American Society of Clinical Neurophysiology
Location: Houston, TX

Date: February, 2016
Title: Case Studies in EMG
Meeting/Event: Annual Meeting, American Society of Clinical Neurophysiology
Location: Orlando, FL

Date: February, 2017
Title: Basic Electromyography
Meeting/Event: Annual Meeting, American Society of Clinical Neurophysiology

Location: Phoenix, AZ

Date: September, 2017
 Title: Basic EMG Course: Case Studies
 Meeting/Event: Annual Meeting, American Association of
 Electrodiagnostic Medicine
 Location: Phoenix, AZ

Date: February, 2019
 Title: Electrodiagnostic Approach to Radiculopathies
 Meeting/Event: Annual Meeting, American Society of Clinical
 Neurophysiology
 Location: Las Vegas, NV

Date: April, 2019
 Title: Severe Neonatal RYR1 Myopathy With Pathological
 Features of Congenital Muscular Dystrophy
 Meeting/Event: Annual Clinical Genetics Meeting, American College of
 Medical Genetics
 Location: Seattle, WA

C. Regional: none

D. Local:

Date: 1993-
 Title: Have given numerous presentations (average one/year)
 Meeting/Event: Neurology Grand Rounds
 Location: Milwaukee, WI

Date: September, 2012
 Title: Deep brain stimulator artifact in needle electromyography:
 Effects and distribution in paraspinal and upper limb
 muscle.
 Meeting/Event: Annual Research Day, Medical Coll WI
 Location: Milwaukee, WI

Date: September, 2012
 Title: End of Life Care for ALS Patients in a Multi-Disciplinary
 Clinic.
 Meeting/Event: Annual Research Day, Medical Coll WI
 Location: Milwaukee, WI

(23) Committee Service:

A. College Wide Committees

- 1997-2000 Dean's Appointee, Library Committee
- 2010 Dean's Appointee, Neurology Self-Study Committee

E. Hospital Committees

- 1996 Ad hoc committee to review guidelines for pre-operative physical examinations (VAMC)
- 2015 Ad hoc Committee (Froedtert Hospital) for Organ Donation Policy for ALS Patients

C. Department of Neurology

- 1998-present Research Committee
- 1998-present Education Committee
- 2006-present Promotion and Tenure Committee
- 2009-2011 Fellowship Advisory Committee

(24) Medical College of Wisconsin Teaching Activities:

A. Medical Student Education

1. Required/Elective Courses

- 1994-present Instructor, "Introduction to Clinical Examination" (ICE) Course, Year II Medical Students
- 1994-2003 M4 Neurology Elective Director: Weekly Discussion Leader for Case Vignette Sessions (about 50-60 students per year: >60 contact hours of teaching/year)
- 2005: Authored and made lecture on CD on Amyotrophic Lateral Sclerosis for M3 lecture series for Neurology Rotation
- 2007- Faculty Discussant to M3 Intersession on Professionalism
- 2010- Participating Faculty, M4 Elective "Art of Medicine Through the Humanities"
- 2010 Facilitator for student discussion group in the Master Clinician pathway (Neuroscience Core Session)
- 2011- Facilitator for student discussion group in the MI Course in Medical Ethics and Palliative Care
- 2011 M1 mentoring program
- 2014- Faculty Advisor, Special Interest in Neurology Group (SIGN) for medical students

- 2015 Lecture: Motor Deficit Disorders. M1 Neuroscience Curriculum.
- 2020- Lecturer and Curriculum Development, "Bench to Bedside Course teaching the neurological examination to M1 students
2. Precepting/Attending
1994-2003 Supervise Clinical Activities (Consults/Clinic) while Attending (2 months/year): 2-6 M3 or M4 students on daily basis during these periods
- B. Graduate Student Education: Precepting rotating students from Marquette University Physician Assistant Program
- C. Resident Education
- Formal
- 1994-present Attending Staff on Wards/Consults (2.5 months/year)
- 1994-present Teaching electromyography to residents while on EMG rotation
- 2000-2004 Coordinated the Clinical Neurophysiology and Basic Neuroscience Lectures for the Neurology Residency Program
- 2009-2010 Invited lecturer by Residents for lectures on peripheral Neuropathy, ALS, & electromyography (I received an Essentially "perfect" score of 36/36 on my teaching in 2010 Receiving specific comments such as "Thank you very much for teaching us, we really appreciate the EMG lectures, very approachable, good heart, love working with him" [n=40])
- D. Fellow Education: In addition to administrative duties, regular teaching interaction and advising of Fellows since 1994.
- E. Postdoctoral Fellow Education: none
- F. Continuing Medical Education
- 1993-present: Grand Rounds (approximately one per 2-3 years)
 Audience: Department of Neurology
 Format: Lecture or Live Patient Presentation
 Topics: Inclusion Body Myositis, Back Pain, Olivopontocerebellar Atrophy, Quantitative EMG, ALS, etc.
- 2007- present: Clinical Neurophysiology Conference
 Audience: Clinical neurophysiology staff and trainees

Format: Formal presentations
 Topics: Anatomy of the compound muscle action potential, motor unit number indexing (MUNIX)

G. Community/Lay Public

- 1994-2002 Invited Speaker, Post-Polio Resource Group of Southeastern Wisconsin (approximately every 2 years)
- 1994-2000 Invited Speaker, Myasthenia Gravis Foundation Support Group (approximately every 2 years)
- 1997 Invited Speaker, Reflex Sympathetic Dystrophy Support Group, Green Bay, WI
- 1998-present Attend ALS Association Board Meetings (6/ year)
- 1998-present Invited Speaker at Milwaukee and Neenah ALS Support Groups as well as Annual Symposium Sponsored by Wisconsin Chapter ALSA

H. Previous Teaching Activities:

- 1980-1985 Laboratory Instructor in Neuropathology
Year II Curriculum
University of Cincinnati, Cincinnati, Ohio
- 1985 Barkhaus PE: "Clinical Pathologic Conference: A Case of Spinocerebellar Degeneration" (Video Tape), University of Cincinnati.
- 1980-1986 Laboratory Instructor in Neuroanatomy
Year II Curriculum
University of Cincinnati, Cincinnati, Ohio
- 1980-1985 Electromyography Seminar (Annual Series)
University of Cincinnati
 - a. Faculty Preceptor in Neurology,
Rural Physician Program
University of Minnesota
- 1988-1993 Lecturer, Postgraduate Courses in Neurophysiology and Neuroanatomy (Department of Neurology)
University of Minnesota
- 1990-1993 Clinical Tutor, Clinical Medicine III, Phase B
University of Minnesota

- 1993 Co-authored booklet on Neurology Case Vignettes while at University of Minnesota that is used in MCW Senior Elective/ Selective
- 1994 Composed Card to summarize Neurological History and Examination that is laminated and issued to all rotating M4 Students; from 2001 it has been issued to all M3 students on required Neurology Rotation, and is frequently requested by Neurology Trainees and Rotating House Staff

(25) Extramural Teaching:

- Date: March/April 2008, 2009, 2010
 Title: Basics in Electromyography (5 Lectures)
 Meeting/Event: Physical Therapy Program, Concordia University
 Location: Mequon, WI
- Date: March 2012
 Title: Basics in Electromyography
 Meeting/Event: Physical Therapy Program, Marquette University
 Location: Milwaukee, WI

(26) MCW Students, Residents, Fellows, Faculty mentored:**Medical Students:**

Advising

a. Formal

1994-present

M4 Advisor

Note: My advisees in 2000 (Anne Lovelle) and 2001 (Doug Woo) both won the Dyke Award in Neurology (given to the outstanding MCW M4 student in Neurology)

2018-

Clinical and Translational Research Pathway
 Gloria Liyang Lin

b. Informal

1994-

M3 & M4 Students

Meet with numerous students per year to assist with scheduling and career issues

1998-2001

Facilitated formation of local chapter of "Student Interest Group in Neurology (SIGN) for American Academy of Neurology

2007-present

Students periodically request accompanying me in ALS Clinic, especially in learning how to communicate with severely ill patients

- 2009-2011 Faculty Guide, "Guiding You Right Up" (GURU) Program (2 students/ year)
- 2011 Invited Faculty (Neurology) to address breakout student sessions for "Career Day", sponsored by MCW Chapter of the AMA
- 2019-2021 Britta Bureau- in career in Neurology

Residents:

Formal mentoring

- 1994 Skantz J. **Barkhaus PE**: Role of neurology in carotid endarterectomy at the Milwaukee VAMC. Wisconsin Society of Neurology, Annual Meeting, 1994. Dr. Skantz received second place in competition for Francis Forster Award (Wisconsin Neurological Society)
- 1994-1997 Supervised M.I. Periquet, M.D. in learning quantitative EMG and doing several research studies. She received the Francis Forster Award in 1995 (Wisconsin Neurological Society)
- 1997-1998 Supervised K.A. Blindauer, M.D. doing clinical studies in spinocerebellar ataxias (see papers below).

Informal mentoring:

- 1993-present Advising Residents on career and personal issues, including assisting in arranging Fellowships, etc. Coached Dr. T. Al-Saadi on his presentation: he won the Francis Forster Award in 1999 (Wisconsin Neurological Society); also Dr. Zack Webb who also won this award.
- 1994-present Acted as Faculty Mentor for:
M. Isabel Periquet, M.D. (1994-1997): Faculty, Ohio State University, later MCW
Deanna L. Dickens, M.D. (1998-2001): Fellow in Epilepsy, University of Minnesota
Douglas Woo, M.D. (2001-2004), Faculty, MCW

Fellows:

Most Fellows have chosen private practice careers.

Some have gone into Academics:

- | | |
|------|---|
| 1995 | Steven Nash, M.D., Ohio State University, Columbus, OH |
| 2007 | Samiya Rashid, MD, Washington University, St. Louis, MO |
| 2010 | Sumit Varma, MD, Assoc Professor, Child Neurology, Emory University |

Faculty:

Alex Barboi, MD: Barboi AC, **Barkhaus PE**: Electrodiagnostic testing in neuromuscular disorders. *Neurol Clinics*, 2004; 22(3):619-640.

Helen Lin, MD Lin HC, **Barkhaus PE**: Cranial Nerve XII: The Hypoglossal Nerve. *Seminars in Neurology* 2009;29:45-52.
 Lin HC, Collins MI, Collins MP, **Barkhaus PE**: Inclusion Body Myositis. In Quan D, Lorenzo NY, Lutsep HL (senior eds): *eMedicine Journal (Neurology)* [serial online]. 2009. Available at <http://www.emedicine.com/neuro/topic422.htm>.

Ryan Brennan, MD Assistant Professor Neurology, MCW

Matt Harmelink, MD Assistant Professor Neurology, MCW

(27) Extramural Students, Staff, Faculty, Residents Mentored:

- | | |
|-----------------------|---|
| Jeanine Petit, RN | Petit J, Barkhaus PE : Evaluation and management of polyneuropathy: A practical approach. <i>The Nurse Practitioner: The American Journal of Primary Health Care</i> 22:131-148, 1997. |
| Claudio Zucca, MD | Zucca C, Binda S, Borgatti R, Triulzi F, Radice L, Botte C. Barkhaus PE , Barbi M: Congenital Cytomegalovirus Infection and Cortical Maldevelopment: A Retrospective Diagnosis. <i>Neurology</i> 61(11):710-712, 2003. |
| Michelle McDonagh | Nutritional and metabolic support in adults with amyotrophic lateral sclerosis, 2013
http://journals.asha.org/perspectives/terms.dtl |
| Faezeh Jahanmiri, PhD | Member, Thesis Committee for PhD., University of Illinois, Chicago, 2013. |

- Sumit Verma, MD Mentor for Proposal, "Electrophysiology studies as outcome measures in humans and dogs with Duchenne Muscular Dystrophy, Department of Defense
- Ji-Geng Yan, MD Mentor for clinical neurophysiology section for NIH submission for "New Treatment for Irreparable Nerve Injury"
- Eric Clark Member, Thesis Committee for PhD, MCW

(28) Programmatic Developments:

Educational Programs:

MCW: While coordinating the Senior Student Elective in Neurology, I developed the case vignettes and examination cards.

National: In 1995 I was asked to develop a Workshop in Quantitative EMG for the American Association of Neuromuscular and Electrodiagnostic Medicine. This has resulted in a publication and web page chapter on this topic that continues to be in use (both peer-reviewed publications). The workshop remains robust and popular. I have taught this workshop continuously since 1994 and always received excellent feedback on the teaching.

National: In 2001 I was asked to be on the Examination Committee of the American Board of Electrodiagnostic Medicine. I was charged with the specific task of converting the waveform recognition section from a spliced together format of VHS tapes on television monitors to a fully digitized format that could be displayed on large screen. This included not only having to record many waveforms de novo, but also clinical videos demonstrating weak muscles, etc. In addition, new material needed to be written and tested. I was able to accomplish this in a year, such that the examination was fully operational in digitized format. This was a novel achievement. Very shortly thereafter, a number of other examining bodies have followed our example, but none have attained the high quality recordings we did. To date, I have been responsible for expanding the library of waveform recordings and questions.

National: Four years ago I was invited to teach the Basic EMG skills workshop at the American Academy of Neurology. I completely rewrote the workshop handout (peer-reviewed), received excellent reviews on my teaching and have been continuously invited back to teach since then.

Research Programs

My ALS Program is also noted for its contributions to clinical research. Ongoing studies include clinical measures outcomes, drug trials, genetic studies, and electrophysiological studies in ALS. The electrophysiological technique of "Motor Unit Number Indexing (MUNIX)" was developed here at MCW/FMLH by me and my colleague and has generated national and international interest. The MCW/FMLH Program and I are now part of an International Consortium working on this technique. The Greater Milwaukee Foundation has recently made two funding contributions for his research efforts. In the past 4 years, I have been a member of "NEALS" (Northeast ALS Consortium which is the largest research consortium for ALS in the USA). This facilitates collaboration in ALS drug trials.

Clinical Programs:

At the time I began the ALS program at MCW/FH, the University of Wisconsin in Madison was solidly considered the premier place of care for ALS. Since I began the ALS program at MCW in 1998, our institution has become very well-known for its high quality clinical care. Based on my reputation, we have now become the destination of choice for patients in this region with this disease and related disorders. In fact, a number of patients going to U WI Madison have transferred their care to MCW/FH. Just recently, WKOW, a Madison TV Station came all the way here to interview me and do a piece on ALS- just 2 years ago this would have been unthinkable.

As a result, we make a large number of referrals to colleagues in Pulmonary Medicine and Gastroenterology. My interactions with Palliative Care have also been very productive. In one report from the United Kingdom, only 60% of ALS patients end up deceasing at home from their illness as per their wishes. In our clinic, I have been

providing care that allows greater than 90% of over patients to decrease at home by promoting regular attention to end of life issues with patients that in turn increases patient quality of life and reduces unneeded expenditure of health care dollars, particularly as inpatient. We feel this is a very helpful and compassionate approach that is just coming to attention in the general medical community.

ALS is an uncommon and devastating disease that affects not only the patients, but their families and communities. In the past 13 years, we have cared for hundreds of cases. As an indirect additional benefit, the quality of care at MCW/FH has prompted families to seek care here for other medical problems. We are recognized nationally as one of almost 40 Certified Centers by the ALS Association in the USA.

Old Polio Patients: Although I have no formal program for such patients, I have been recognized since coming to MCW in 1993 as an expert in Post Polio Syndrome, regularly seeing such referrals from healthcare providers around the region. These patients often require referrals to other MCW colleagues in different departments such as Orthopedics, Physical Medicine & Rehabilitation, and Neurosurgery. I have also been a physician resource for the local Post Polio Resource Group.

Milwaukee VAMC: In 2010, I have been asked to develop the Tele-Medicine program for the Neurology Outpatient Program. This project is Currently in the planning stage, although approval has been obtained to equipment purchase.

(29) Community Service Activities:

1994-1998	Medical Board Advisor, Myasthenia Gravis Foundation (Mke Chapter)
1996-present	Medical Board Advisor, ALS Association, SE Wisconsin Chapter
1999-2006	Committee Member, Troop 400, Boy Scouts of America

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Refereed Journal Publications:

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Group-Authored (formally acknowledged authorship within the group) Refereed Journal Publications (continued): ALSUntangled series in the journal *Amyotrophic Lateral Sclerosis & Frontotemporal Degeneration* that began in 2009 and has had over 200,000 downloads and won the 2019 American Academy of Neurology Brainstorm Innovation Award:

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52. Statland JM, Herbelin L, Kimminau KS, McMahan T, Adagarla B, Barkhaus PE, et al: Patient Activity of Daily Living for Amyotrophic Lateral Sclerosis. *American Academy of Neurology, Annual Meeting, Boston*, 2017.
53. Vuppala A, Lakraj A, **Barkhaus PE**, Collins MP: Recurrent breast cancer presenting with indolent peripheral nerve metastases mimicking chronic inflammatory neuropathies: two cases. *American Academy of Neurology Annual Meeting, Boston*, 2017.
55. Stephanie Santarriaga, Emily R. Seminary, Eric Clark, Dominic Fee, **Paul E Barkhaus**, Brian A. Link, Allison D Ebert, K. Matthew Scaglione: Using a novel molecular chaperone to reduce toxic proteins in ALS model systems. *29th International Symposium on Motor Neurone Disease, Glasgow*, 2018.
56. Anton A, **Barkhaus PE**, Sherman K, Ratarasan K: Greater tolerance to disease progression and survival advantage with volume assured pressure support ventilation in patients with ALS. *29th International Symposium on Motor Neurone Disease, Glasgow*, 2018.

57. Kavanaugh M, Howard M, Fee D, **Barkhaus PE**, Banker-Horner L: *YCare*: Multidisciplinary caregiving and skills and intervention for young caregivers in families with ALS. 29th International Symposium on Motor Neurone Disease, Glasgow, 2018.

58. Kelley E, McDonagh M, Fee D, **Barkhaus PE**: The Frazier Free Water Protocol: A case study intervention for dysphagia and aspiration pneumonia. NEALS Annual Meeting, Clearwater, FL, 2019.

Peer-Reviewed Works Cited:

Citation Index: Dr. Barkhaus' works have been cited over 400 times in literature.

Textbooks: Original and seminal research by Dr. Barkhaus has been cited over 80 times in current textbooks and reviews, particularly those in Clinical Neurophysiology and Neuromuscular Diseases.

eMedicine Chapters: eMedicine is the world's largest online, peer-reviewed medical reference. It is a unique publishing venture covering most major specialties. Though it is technically a textbook series, it is serialized like a journal to facilitate maintaining updates that are made on a regular basis. As of 2018, Dr. Barkhaus' 3 principal chapters have received >50,000 hits- refs 14,15,& 26.

Articles: International Federation of Clinical Neurophysiology (IFCN) & its Clinical Neurophysiology journals[Motor unit number index (MUNIX)] Nandedkar et al.: "From a practical viewpoint, it takes us less than 5 minutes to perform a MUNIX study including skin preparation, electrode application,..."
<https://clicktime.symantec.com/3EDacCcfWnBpsQVZBKjS2Br7Vc?u=www.facebook.com>
 Dr. Eishi Asano, the Social Media Editor of Clinical Neurophysiology has highlighted our paper published in Clinical Neurophysiology on the Official Twitter and Facebook Pages of the International Federation of Clinical Neurophysiology.

Peer-Reviewed Educational Products: In 1997 I began working on what has become an exciting educational venture with my long-time collaborator. These became a series of "multi-media" books on DVD. To date I have co-authored three of these with the first being revised into a second edition (See pages 30 & 32 above, "Books, Chapters, Reviews", references 5, 6, 12, 25). These were exciting but time-consuming projects that integrated a large corpus of material into various aspects of clinical electromyography. Although a few others have attempted to compete, our projects still stand out in quality and technical expertise. The "Myoanatomy Atlas" has brought to life what used to be two dimensional drawings in books. It would be like comparing the written score of an opera in book form to a DVD recording of an actual performance with accompanying text and other visual aids. *To date, these have been, or are being used, in almost a hundred academic centers/ training programs in electromyography in North America and at least other 50 countries.*

Mark B. Bromberg, MD wrote an extensive review of these DVD's for Muscle Nerve, the premier journal in electromyography and the official journal of the American Association of Neuromuscular and Electrodiagnostic Medicine (2009;22(10)1468-1469).

"Dr. Barkhaus is a clinical electromyographer with extensive experience with quantitative EMG and electrode recording characteristics..... They bring an extraordinary amount of experience to

these DVDs. They are very good and clear teachers.... All in all, I found the method of live presentation very effective.... Drs. Nandedkar and Barkhaus are pioneering a new medium to teach electromyography. It is like having a private tutorial with an experienced engineer and clinician, with a complete spectrum of patients..... I highly recommend this for all teaching programs, for any trainee, and for anyone who wishes to improve their skills."

Community Service

- 1998- Medical Advisor, Member, Medical Advisory Board. ALS Association, SE Wisconsin Chapter
- 2021 Facilitator, Building Bridges. Promoting Community Dialogue. Whitefish Bay, WI