University of Maryland
Claude D. Pepper Older Americans Independence Center
(UM-OAIC)

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I. CENTER DESCRIPTION

The **overarching UM-OAIC goal** is to build on the sciences and therapeutic applications of exercise and rehabilitation by: 1) advancing our understanding of the mechanisms by which exercise and activity-based rehabilitation interventions directed at specific impairments affect multiple body systems underlying functional performance; and 2) developing and testing interventions to restore function and minimize disability following acute disabling events and gradual declines related to serious chronic diseases.

The functional impairments and disabilities that occur in older people emanate from acute events, such as stroke, heart attack, and hip fracture, or reflect the progression of chronic diseases. Older people aging with chronic diseases have a reduced aerobic capacity and develop sarcopenia, weakness, fatigue, and neuromotor and cognitive impairments that reduce their physiological reserve, impair their ability to function independently, and increase their level of medical care and risk for institutionalization and death. This pathway of how disease leads to disability has been discussed extensively by Nagi, made more operational by Verbrugge and Jette, and extended further to include socio-environmental elements by the IOM and WHO. More recently, further commentary debates how best to understand functioning and disablement.

The UM-OAIC mission embodies the process by which function is lost and the multiple factors identified thus far that affect the onset and progression of disability. Building on these important perspectives, the UM-OAIC focuses on the restoration of function in order to improve function in those with impairments, and prevent or delay further progression in those who are already disabled. This has been aptly referred to as enablement. (10, 11) The UM-OAIC will continue to focus its research on the processes involved in enablement by identifying the deficits or impairments associated with specific disabling conditions, investigating the mechanisms and pathophysiology leading to the impairments, developing exercise and other activity-based interventions that target these mechanisms and deficits, testing them in clinical laboratories/centers under carefully controlled conditions, and then adapting them for implementation and further testing in community settings outside the medical center.

The specific aims of the UM-OAIC are to:

1. Conduct research that examines the mechanisms underlying the functional impairments associated with stroke, hip fracture, and prevalent chronic diseases in older people;
2. Design novel, efficacious exercise and activity-based rehabilitation interventions that produce clinically relevant outcomes and study the mechanisms underlying them;
3. Translate the most efficacious interventions developed in UM-OAIC clinical laboratories and in other clinical centers for implementation and rigorous evaluation outside the clinic (e.g., home, senior center, gym).
4. Support pilot and exploratory studies (PESs), UM-OAIC junior scholar research, development projects (DPs), and externally funded projects (EP) that examine the mechanisms underlying disability and the processes of recovery, and that design and test interventions for the restoration and maintenance of function in clinical laboratories and settings outside the medical center.
5. Foster the career development of junior faculty/scholars from multiple disciplines into independent, academic scientists with expertise in the study of older persons with disabling diseases through mentor-based, bench-to-bedside translational research training that includes didactic and experiential/practical-applied training in conducting independent, aging research.

The UM-OAIC has three resource cores (RC): Biostatistics, Informatics and Translational Science (RC-1); Applied Physiology and Tissue Mechanisms (RC-2); and Neuromotor Mechanisms and Rehabilitation (RC-3), that serve as a resources for the conduct of innovative exercise and activity-based rehabilitation research. An enhanced Research Education Core (REC) (formerly RCDC) will provide didactic and experiential training under the guidance of an interdisciplinary mentoring team to prepare the next generation of scientists committed to careers in aging research. Center aims will be accomplished by: 1) using multidisciplinary research working groups (RWGs) to provide mentoring and guide REC and PES investigators and faculty scholars in designing and conducting their projects, reporting results, and developing future investigations; 2) supporting studies that

determine the mechanisms underlying functional impairments and implement exercise and activity-based rehabilitation interventions to improve clinically relevant outcomes; and 3) translate safe and efficacious interventions into randomized clinical trials outside the medical center with the goal of changing practice for those with disabling diseases and conditions. The restoration of functional independence through an integrated approach that includes exercise and activity-based rehabilitation will transform the care of older people with disabling diseases and conditions.

II. RESEARCH, RESOURCES AND ACTIVITIES
A. CORES

1. Biostatistics, Informatics and Translational Research (RC1)

Core Leader: John D. Sorkin, M.D., Ph.D., (Telephone: 410-605-7119, E-mail: jsorkin@grecc.umaryland.edu), Core Co-Leaders: Laurence Magder, Ph.D., (Telephone: 410-706-3253, E-mail: lmagder@epi.umaryland.edu) and Michael Terrin, M.D., C.M., M.P.H., (Telephone: 410-706-6139, E-mail: mterrin@epi.umaryland.edu)

RC1 provides biostatistical and informatics support to investigators, to help design interventions that prevent functional decline, promote restoration and maintenance of function, and to facilitate the translation of interventions from laboratory to clinic and community. We will participate in Research Working Groups (RWGs), a forum in which investigators from multiple disciplines collaborate on the design and conduct of studies. Our informatics system (GERI) will provide an infrastructure that helps us manage studies, and facilitates the flow of information and data. RC-1 draws on the resources and statistical expertise of the UM Department of Epidemiology and Public Health's Divisions of Biostatistics and Bioinformatics, and Gerontology. We share resources and personnel with the biostatistics cores of the Baltimore VA Geriatrics Research, Education, and Clinical Center (GRECC), the VA RR&D Maryland Exercise and Robotics Center of Excellence (MERCE), and the UM Nutrition Obesity Research Center (NORC). The resultant synergy saves money and makes the whole more than the sum of its parts. Statistical methods, hardware purchased and software developed by one center are used by all centers.

The specific aims of RC-1 are to:

1. Provide a centralized, user-friendly information management system (GERI) that:
   a) Facilitates submission of requests for core services, schedules and tracks use of core resources
   b) Facilitates recruiting of subjects
   c) Monitors study progress by tracking recruiting efforts and subject progress through studies
   d) Informs investigators and OAIC leadership of adverse events
   e) Facilitates data management
   f) Ensures confidentiality, physical security, and logical integrity of data
   g) Promotes data completeness, accuracy, and validity
   h) Improves laboratory quality control, and automates the review of study data.

2. Provide biostatistical expertise to UM-OAIC investigators by:
   a) Planning studies that are optimally designed, adequately powered, statistically efficient and that lead to valid, unbiased estimates of parameters
   b) Randomizing subjects
   c) Analyzing data
   d) Helping investigators with the interpretation and presentation of results
   e) Helping investigators and clinicians get access to, and provide analytic support for "big data" science.
3. Participate in Research Working Groups (RWGs) that will assist UM-OAIC investigators:

a) Design and conduct studies, analyze and interpret data, and publish study results
b) Optimize treatment fidelity and translate studies from the laboratory to the clinic and community.

4. Provide training to UM-OAIC faculty, trainees, and staff in biostatistics and epidemiology.

2. Applied Physiology and Tissue Mechanisms (RC2)

Core Leader: Alice Ryan, Ph.D., (Telephone: 410-605-7851, E-mail: aryan@grecc.umaryland.edu) and Core Co-Leader: Leslie I. Katzel, M.D., Ph.D., (Telephone: 410-605-7248, E-mail: lkatzel@grecc.umaryland.edu)

Cardiovascular deconditioning, chronic inflammation, and endocrine-metabolic dysfunction are inherent to the pathophysiology of the physical impairments in older persons hindered by disabling chronic diseases of aging. Sarcopenia, poor fitness, inflammation, metabolic syndrome, and acute events related to disability such as stroke and hip fracture occur with advancing age which may worsen mobility and increase risk for cardiovascular disease (CVD) and metabolic abnormalities. The RC2 hypothesis is that that exercise and activity-based rehabilitation can improve multiple physiological systems in older, mobility limited individuals leading to improved functional performance, reduced cardiometabolic disease risk, and prevention of functional decline. By determining the composition, molecular, and metabolic abnormalities in skeletal muscle, adipose tissue, and vascular endothelium, and response to exercise rehabilitation, we can optimize exercise interventions to improve muscle structure, function, metabolism, and CVD risk profiles in older adults with these chronic conditions. Exercise interventions may potentially reduce risk and delay chronic disability in older adults.
To achieve this goal, RC2 implements specific aims that:

1. To facilitate the conduct of musculoskeletal and tissue mechanistic exercise rehabilitation and preventive biomedical research in aging and disability across the UM-OAIC pilot projects, OAIC scholars' research, Development Projects (DPs), and external NIH and VA funded research through:

a.) Patient recruitment, the performance of medical assessments and cardiovascular screening of research volunteers to ensure patient safety and eligibility for research protocols;
b.) The development and testing of novel exercise-based interventions (aerobic, resistance, multi-modal training) and collaborations with rehabilitation science in RC-3;
c.) The clinical, cardiometabolic and functional profiles at the whole body and tissue level before and after exercise training.

2. To provide research support, mentoring, and training to OAIC scholars, junior faculty, and OAIC researchers in the performance of aging research relevant to exercise and rehabilitation-based restoration of function and the prevention of functional declines in older people with chronic disabling diseases through:
   a.) Mentoring in research working groups (RWGs) to provide educational and consultative resources to OAIC junior and senior investigators in the design and implementation of their research;
   b.) Clinical applied training in the conduct of translational research and the assessment of cardiovascular and physiological outcomes of exercise rehabilitation in aging; and
   c.) Laboratory training in standardized core methodologies in order to gain expertise in the performance of cardiovascular and metabolic testing, exercise testing, and cellular and molecular assays at the bench to facilitate their bedside to bench translational research.

The characterization of the clinical and metabolic phenotype(s) of individuals with stroke, hip fracture and other chronic disabling diseases in RC-2 has allowed UM-OAIC investigators to develop successful specific exercise rehabilitation strategies to improve functional and clinical outcomes. Thus this core, in collaboration with the other OAIC cores will continue to support innovative research studies examining the mechanisms and physiological effects of multisystem rehabilitation and preventive strategies on functional and physiological outcomes in older adults aging with chronic disabilities with translation of these outcomes in novel clinical trials.

3. Mobility Function and Neuromotor Plasticity (RC3)

Core Leader: Mark Rogers, Ph.D., P.T., (Telephone: 410-706-0841, E-mail: mrogers@som.umaryland.edu) and Core Co-Leader: George Wittenberg, M.D., Ph.D., FASNR (Telephone: 410-706-4456, E-mail: gwittenberg@som.umaryland.edu)

The combination of physical impairments and a sedentary lifestyle with aging and chronic conditions such as stroke, hip fracture, metabolic syndrome and Parkinson's disease, results in multi-system brain, neuromotor, physiological, behavioral, and cognitive deficits that precipitate loss of functional independence and disability. The central hypothesis of Resource Core-3 (RC-3) Neuromotor Mechanisms and Rehabilitation is that appropriately-selected functional activity and exercise-based rehabilitation interventions can promote beneficial changes in brain [central nervous system (CNS) structure, connectivity, and physiology] and neuromotor mechanisms to improve motor performance and function and minimize chronic disability in older people.

RC-3 provides support, guidance, and mentoring to UM-OAIC investigators using a multi-system approach focused on whole-body balance, locomotion, and upper limb activities to address the mechanistic bases upon which to build novel rehabilitation strategies to improve motor function and independence and promote recovery in older people with chronic disease-associated disabilities. Through this framework, functional activity and exercise-mediated brain and neuromotor plasticity can be identified to guide condition-specific and individual-specific rehabilitation approaches for minimizing disability. The complementary and collaborative relationship between RC-3 and RC-2 -- which focuses on muscle, metabolic, and cardiovascular mechanisms of aging with disability -- forges a strong and comprehensive inter-core synergy for understanding the bases for designing and testing effective new rehabilitation programs to restore and sustain functional independence and quality of living among older individuals.

The specific aims of RC-3 are:

1. To develop, enable, and support the investigation and identification of brain and neuromotor mechanisms associated with functional performance for the development of novel and effective activity and exercise-based rehabilitation interventions to enhance whole-body balance, mobility, and upper limb motor functions and minimize disability among people with chronic health conditions of aging.
2. To assist, mentor, and support trainees, junior faculty, and UM-OAIC investigators through research working groups (see REC) in the design and conduct of functional activity and exercise-based rehabilitation interventions that will be translated from the laboratory to the clinic and into the community to improve functional independence in older individuals with chronic disease-associated disability.
3. To perform testing and assessments using the core repertoire of methodologies to quantify the brain and neuromotor mechanisms of balance, postural control, mobility, upper limb activities, and disability phenotype that characterize the processes of adaptive plasticity underlying structured activity and exercise-derived functional gains across UM-OAIC rehabilitation-based interventions.

The brain and neuromotor changes and accompanying impairments of chronic medical conditions of aging that limit functional performance and lead to disabilities will be investigated in RC-3. This knowledge will form the mechanistic bases for the development and testing of functional activity and exercise-based rehabilitation interventions to improve functional outcomes and alleviate disability. In collaboration with the other cores, RC-3 will advance the overall UM-OAIC goal to build on the sciences and therapeutic applications of exercise and rehabilitation to restore function and minimize disability due to acute disabling conditions and long-term declines related to chronic conditions of older age.

4. Leadership and Administrative Core (LAC)

Core Leader: Jay Magaziner, Ph.D., M.S.Hyg., (Telephone: 410-706-2406, E-mail: jmagazin@epi.umaryland.edu) and Co-Directors: Leslie I. Katzel, M.D., Ph.D., (Telephone: 410-605-7248, E-

mail: lkatzel@grecc.umaryland.edu) and Alice Ryan, Ph.D., (Telephone: 410-605-7851, E-mail: aryan@grecc.umaryland.edu)

The Leadership and Administrative Core (LAC) will ensure that the UM-OAIC provides support for training the next generation of scientists pursuing research careers in aging, and the conduct of novel research in older adults directed at the UM-OAIC goals of: 1) advancing our understanding of the mechanisms by which exercise and activity-based rehabilitation interventions directed at specific functional impairments affect multiple body systems underlying functional performance; and 2) developing and testing interventions to restore function and minimize disability following acute disabling events and gradual declines related to serious chronic diseases.

The LAC will foster ongoing discussion among core leaders and faculty scholars to ensure that research and research training are carried out in a cohesive, coordinated and integrated manner. The LAC will also engage scientists and educators from across the University of Maryland Baltimore (UMB) community so that research and research training can take full advantage of the breadth and depth of experience in aging and other relevant areas to facilitate collaborations that advance UM-OAIC goals.

The LAC will receive input and guidance and discuss program operations in the Core Leadership Executive Committee (CLEC) of resource core (RC) leaders; the UM-OAIC Research and Education Advisory Committee (REAC) charged with reviewing proposed Development and Pilot/Exploratory Studies; an Internal Advisory Committee (IAC) charged with evaluating UM-OAIC progress and accomplishments and advising on ways to extend research on aging to other university centers and departments; and an External Advisory Board (EAB) that will provide guidance to the program and report progress annually to the NIA. In addition, the LAC will support an Internal Data and Safety Monitoring Board (I-DSMB) that will review the conduct of clinical protocols to ensure patient safety, and an External Data and Safety Monitoring Board (DSMB) that will provide another layer of review by experienced scientists who can remain impartial as they monitor data quality and safety, and report to the NIA annually (Figure 1).

Specific Aims of the Leadership and Administrative Core are to:

1. Coordinate and oversee all aspects of the UM-OAIC, establishing collaborations with other centers, investigators and institutions that contribute to UM-OAIC goals.
2. Enrich the cadre of basic, clinical and population scientists conducting translational research in aging by recruiting outstanding junior and senior faculty and research staff to become involved in the UM-OAIC.
3. Advance the careers of junior faculty from multiple disciplines to become independent investigators and academic leaders in aging research.
4. Develop resources that support the conduct of basic, clinical, and translational research designed to advance UM-OAIC goals.
5. Ensure independent review and oversight of UM-OAIC research and scholar training, data quality, and safety for studies undertaken by pilot study investigators and faculty scholars.
6. Manage the UM-OAIC budget and distribution of funds, assure adherence to federal regulations and NIA policies, and report scientific progress and resource use annually to NIA.

5. Pilot and Exploratory Studies Core (PESC)

Core Leader: Mary Rodgers, P.T., Ph.D., F.A.P.T.A., F.A.S.B. (Telephone: 410-706-5658, E-mail: mrodgers@som.umaryland.edu) and Core Co-Leaders: Glenn Ostir, Ph.D., (Telephone: 410-706-3907, E-mail: gostir@epi.umaryland.edu) and Marc Hochberg, M.D., M.P.H., MACP, MACR, (Telephone: 410-706-6474, E-mail: mhochber@umaryland.edu)

The purpose of the UM-OAIC Pilot and Exploratory Studies Core (PESC) is to provide critical, initial funding for pilot and exploratory studies that are consistent with the Center's overall goal, which is to build on the

sciences and therapeutic applications of exercise and rehabilitation by: 1) advancing our understanding of the mechanisms by which exercise and activity-based rehabilitation interventions directed at specific impairments affect multiple body systems underlying functional performance; and 2) developing and testing interventions to restore function and minimize disability following acute disabling events and gradual declines related to serious chronic diseases.

To meet this objective, the PESC will provide research support and mentoring of investigators with high quality pilot and exploratory research proposals designed to acquire preliminary data needed for future crucial studies congruent with the Center's focus: examination of the mechanisms underlying mobility limitation, physical disability, and recovery from disability in vulnerable older adults, and assessment of functional and clinical responses to novel exercise and activity-based rehabilitation interventions.

The specific aims of the PESC are:

1. Solicit and select high quality, innovative pilot and exploratory studies (PES) that are relevant to the UM-OAIC goal.
   a.) Identify talented junior faculty and other investigators interested in conducting studies to advance the UM-OAIC goal.
   b) Review, select and fund the highest quality pilot and exploratory studies that have the potential to acquire preliminary data required for future studies of innovative rehabilitation interventions that will optimize the recovery of older individuals who are disabled by stroke, hip fracture, Parkinson's disease, or other chronic metabolic, neuromuscular or musculoskeletal diseases.
2. Support the implementation of innovative and promising pilot and exploratory studies and facilitate their development into independently funded grant applications through establishment of multidisciplinary Research Working Groups (RWGs), in coordination with the Research Education Core (REC), Resource Cores (RCs) and Leadership and Administrative Core (LAC).
   a) Assist pilot and exploratory study investigators in the conduct of their research and in accessing resources from UM-OAIC cores, research programs and centers at the University of Maryland Baltimore (UMB), and nationally through collaboration with other OAICs;
   b) Ensure and monitor adherence to ethics, safety, privacy and protection of human subjects enrolled in PESC studies; and
   c) Monitor and evaluate the progress of pilot and exploratory studies.

The PESC will support five innovative studies involving multidisciplinary rehabilitation research in the first year of this competitive renewal. The preliminary data obtained in these studies will form the basis for larger, investigator-initiated studies. Thus, PESC leadership will attract investigators to study exercise and activity-based rehabilitation and recovery in older adults with disabling chronic conditions, stimulate new studies in aging rehabilitation research through targeted funding, encourage new interdisciplinary collaborations, and translate efficacious therapies across the spectrum from bench to clinical laboratory to community practice. This will advance the UM-OAIC research goal of expanding impairment specific and activity-based therapies in the broadest context of geriatric rehabilitation that emphasizes restorative and preventive medicine to promote the recovery and health of older adults with disabilities.

6. Research Career Development Core

Co-Core Leaders: Jay Magaziner, Ph.D., M.S.Hyg., (Telephone: 410-706-2406, E-mail: jmagazin@epi.umaryland.edu) and Mary-Claire Roghmann, M.D., M.S., (Telephone: 410-706-0062, E-mail: mroghman@epi.umaryland.edu)

The purpose of the Research Education Core (REC) is to foster the career development of junior faculty from

multiple disciplines into academic scientists in gerontology and geriatrics, focusing on the theme of exercise and activity rehabilitation and recovery research. The REC supports mentor-based research training and education to promote the career development of REC Scholars as well as other junior faculty, fellows, and students pursuing research careers in aging. The UM-OAIC has a successful history of mentored training that crosses traditional disciplinary boundaries to develop novel research for improving function and independence in older persons. This has enriched the cadre of scientists at UM and elsewhere conducting aging research in exercise and rehabilitation science.

The specific aims of the REC are to:

1. Recruit, select and support REC Scholars. Identify, select, and support promising junior faculty and prepare them as independent investigators in the design and implementation of exercise rehabilitation research to foster independence in older people with disabling chronic diseases. This is accomplished by:
   a.) Recruiting and selecting talented junior faculty whose research and career goals are congruent with the UM-OAIC goals and
   b.) Ensuring support for the REC Scholars by departmental commitment to protected time for research training and mentoring, access to resources for the conduct of pilot and exploratory studies, and career development opportunities.
2. Mentor REC Scholars and Affiliated Scholars. Provide a multidisciplinary team approach for individual and group mentoring to REC Faculty Scholars and Affiliated Faculty Scholars and trainees conducting research congruent with the UM-OAIC, but receiving salary from other career development funding mechanisms. This is accomplished by:
   a.) Building interdisciplinary Research Working Groups (RWGs) that include the Scholar, the PI's primary mentor, a scientist from each core, and ad hoc experts to provide mentoring and guidance on the design, implementation, and conduct of their studies. RWGs ensure comprehensive mentoring and career development, guidance in the application of best practices for the conduct of their research, access to collaborations, and the infrastructure to guide the investigator's academic development.

Over 20 years, the UM-OAIC has provided 35 Faculty Scholars and many postgraduate trainees with a rich learning environment for their career development, exposure to gerontology and geriatrics, and resources for pursuing independent research related to the theme of the UM-OAIC. This approach has resulted in 23 of our former 35 REC Scholars attaining independent funding and academic advancement.

3. Provide Career Development Opportunities in Areas Relevant to Aging Research. The REC training program is tailored to meet the individual and group needs of REC Scholars and other trainees. This is accomplished by:
   a.) Developing an individualized career development plan (CDP) that leverages the strengths of the UM-OAIC and institutional career development resources to meet the needs of each REC Scholar. Scholars develop a working CDP for didactic and experiential, applied training with their mentor in the classroom, laboratory and clinic that meets their academic needs. All receive training in the Responsible Conduct of Research (RCR) with an emphasis on ethical and safety issues in studying older people.
   b.) Providing opportunities to REC Scholars, REC Affiliated Scholars, fellows, and students for additional instruction and collaboration in scholar-driven RWG meetings and data reviews, journal clubs, Center on Aging seminars, mock study sections, and research methods seminars presented in conjunction with the other UM campuses and the Johns Hopkins OAIC, and the NIA Gerontology Research Center. Proximity to NIH allows easy access to other aging-related seminars.
4. Evaluate the Activities of the REC. This will be achieved by an evaluation team that measures the short term and long term success of the REC aims using established quantitative and qualitative metrics, informal focus groups and individual meetings to track the needs and accomplishments of Scholars, success of our trainees and meetings to provide feedback to REC Scholars, other trainees, mentors, and UM-OAIC leadership and advisory committees.

The REC's comprehensive research training program has developed junior scholars trained with skills at

the bench and in the conduct of clinical research, posed to translate clinical problems into mechanistic studies, and laboratory findings into clinical application in the elderly. This is why our Scholars are so successful in the receipt of federal career development awards (NIH Ks and VA CDAs), and subsequent independent research funding and academic promotion.

UM-OAIC Career Development Awardees

Currently Funded Awardees:

- 2014-2017: ***Kelly Westlake, Ph.D., MSc, PT*** Assistant Professor, Department of Physical Therapy and Rehabilitation Sciences, School of Medicine, University of Maryland Baltimore

"Probing the Neural Basis and Influence of Cognitive Changes on Impaired Balance in Older Adults"

A. Research Progress Report: Dr. Westlake investigates the neural underpinnings and cognitive contribution to reach, grasp and balance responses in older adults at low and high risk of falling by evaluating the spatiotemporal transitions between cognitive brain networks and reactive balance responses following platform perturbation during gait and tests of neurocognitive function. Data collection and analysis for the first phase of this research is completed (10 young adults, 11 older non-fallers, 12 older fallers). The findings provide preliminary evidence of the cognitive deficit in attention shifting away from an ongoing working memory task that underlies delayed and inaccurate protective reach to grasp responses in older adult fallers. Results have been presented at 4 meetings, 1 manuscript has been accepted, and 1 is under review.

B. Mentoring [Core use]: Rogers (primary), Wittenberg, Adali (RC-1, RC-3)

C. Goals for career progression by the end of the UM-OAIC Award: Preparation for a 3rd manuscript regarding the neuroimaging findings is currently underway. Plans for 2016 include an NIH R21 grant submission to further probe the mechanisms and possible treatment options for impaired protective arm responses in older adults.

- 2014-2017: ***Rishi Kundi, M.D.***, Assistant Professor, Department of Surgery, School of Medicine, University of Maryland Baltimore

"Functional Benefit of Exercise Therapy after Endovascular Intervention in Older Patients with PAD"

A. Research Progress Report: Little data exists regarding the degree to which surgical outcomes and mobility function deficits can be improved by the addition of adjuvant exercise therapy to standard endovascular revascularization in older people with peripheral arterial disease (PAD). This study seeks to define these improvements and explore the mechanisms underlying them. The underlying hypothesis is that the addition of neuromuscular electrical stimulation to a structured exercise rehabilitation program after standard revascularization in older PAD patients will improve function and quality of life, compared to standard revascularization, through mechanisms including increases in target vessel flow, angiogenesis and beneficial alterations in muscle ultrastructure and metabolism. The preliminary results obtained through preoperative testing of 10 patients have demonstrated significant deficits in functional mobility and in measures of distal perfusion responses to exercise. Enrollment into the intervention continues. Four abstracts have been accepted for presentation at national meetings. Additional funding ($15,000) has been obtained from a Society for Vascular Surgery Foundation Seed Grant. Career development award applications was submitted to the VA in the spring of 2016

B. Mentoring [Core Use]: Lal (Primary), Ryan, Prior, Goldberg, Alon (RC-2)

C. Goals for career progression by the end of the UM-OAIC Award: Revise and resubmit CDA. Enrollment of subjects will be complete by spring of 2016 and the results written up for publication by the end of 2016.

- 2015-2018: ***Derik Davis, M.D.,*** Assistant Professor, Department of Diagnostic Radiology & Nuclear Medicine, School of Medicine, University of Maryland Baltimore

A. Research Progress Report: Dr. Davis began his position as a scholar in July 2015. He has rapidly established

his RWG, CDP and research plan.
Project 1 (Male Hip/Ancillary CT Study; PI: Dr. Terrin; additional mentors: Drs. Magaziner, Goldberg, Ryan)
1) Fall 2015: Executive Committee approved application for secondary analysis of the Baltimore Hip Fracture Study. Current working title: "Association of visceral and truncal adiposity with functional recovery after hip fracture in a longitudinal 12-month study"2) Winter/Spring 2016: Initial start to secondary analysis began in March 2016. Outcome variables: LEGS total score, SPPB total score, LEGS subcomponents, SPPB subcomponents. Primary independent variables: truncal fat mass, age, sex + other independent variables3) Spring 2016: April/May 2016 beginning image analysis for CT scan calculation of visceral adiposity mass, followed by additional analysis. Outcome variables: LEGS total score, SPPB total score, LEGS subcomponents, SPPB subcomponents. Primary independent variables: visceral adiposity mass (VAT), subcutaneous fat adiposity mass (SAT), age, sex + other independent variables
Project 2 (Health ABC Study; Mentors: Drs. Terrin, Goldberg, Ryan; External Health ABC co-authors: Drs. Stephen Kritchevsky – Wake Forest, Denise Houston – Wake Forest)
1) February 2016: Application for use of Health ABC Study for secondary analysis.
2) March 2016: Application approved by Health ABC executive committee. Current working title: "Examining Sarcopenia as an Independent Risk Factor for Low Bone Density in Older Adults in the Health ABC Cohort".3) March /April 2016: Apply for U of Maryland IRB approval 4) Spring / Summer: Begin analysis
B. Mentoring [Core Use]: By project above
C. Goals for career progression by the end of the UM-OAIC Award: Obtain preliminary data and publications to support Radiological Society of North America (RSNA) Research Scholar Grant and K08 application by the end of 2017. Complete Certificate in Clinical Research by 2018.

UM-OAIC Junior Scholars (Research supported by the UM-OAIC):

2001-2004	**Larry Forrester, Ph.D**., Associate Professor, Department of Physical Therapy, School of Medicine, University of Maryland Baltimore
2001-2004	**Marianne Shaughnessy, Ph.D., CRNP**, Program Analyst, Office of Geriatrics Programs, Veterans Health Administration
2001-2004	**Denise Orwig, Ph.D**., Associate Professor, Department of Epidemiology and Preventive Medicine, School of Medicine, University of Maryland Baltimore
2004-2006	**Jacob Blumenthal, M.D.**, Assistant Professor, Department of Medicine, School of Medicine, University of Maryland Baltimore
2004-2006	**Eun-Shim Nahm, Ph.D., RN**, Professor, Department of Organizational Systems and Adult Health, School of Nursing, University of Maryland Baltimore
2004-2006	**Federico Villagra, Ph.D., PT**, Visiting Physiologist, Hospital Universitario Virgen del Rocio, Pamplona Spain
2004-2007	**Kris Ann Oursler, M.D.**, Associate Professor, School of Medicine and Research Institute, Virginia Tech/ Salem VA Medical Center
2004-2007	**Ram Miller, M.D., CM, MSc, MBA, FRCPC**, Director of Clinical Development, Muscle Metabolism Discovery Performance Unit, GlaxoSmithKline
2005-2008	**Sandy McCombe Waller, Ph.D.**, Associate Professor, Department of Physical Therapy and Rehabilitation Sciences, School of Medicine, University of Maryland Baltimore
2009-2011	**Kathleen Michael, Ph.D., RN, CRRN**, Assistant Professor, Interim Chair- Department of Organizational Systems and Adult Health, School of Nursing, University of Maryland Baltimore
2011-2014	**Douglas Savin, Ph.D.,** Assistant Professor, Department of Physical Therapy and Rehabilitation Sciences, School of Medicine, University of Maryland Baltimore
2011-2014	**Avelino Verceles, M.D.,** Assistant Professor, Department of Medicine, School of Medicine, University of Maryland Baltimore

2012-2015 **Michael Dimyan, M.D.,** Assistant Professor, Department of Neurology, School of Medicine, University of Maryland Baltimore

2014-present **Kelly Westlake, Ph.D., MSc, PT,** Assistant Professor, Department of Physical Therapy and Rehabilitation Sciences, School of Medicine, University of Maryland Baltimore

2014-present **Rishi Kundi, M.D.**, Assistant Professor, Department of Surgery, School of Medicine, University of Maryland Baltimore

2015-present **Derik Davis, M.D.,** Assistant Professor, Department of Diagnostic Radiology & Nuclear Medicine, School of Medicine, University of Maryland Baltimore

B. RESEARCH

Below is a listing of the current Pepper Center supported studies followed by a listing and brief description of several independently funded supported studies.

Major Grants Associated with the UM-OAIC

Research Projects	PI
UM-OAIC Scholar Projects	
Association of visceral and truncal adiposity with functional recovery after hip fracture in a longitudinal 12-month study	D.Davis, MD; 2015-2018
Functional Benefit of Exercise Therapy after Endovascular Intervention in Older Patients with PAD	R. Kundi, MD; 2014-2017
Probing the Neural Basis and Influence of Cognitive Changes on Impaired Balance in Older Adults	K. Westlake, PhD, PT; 2014-2017
Developmental Project	
Multi-system Exercise Intervention to Enhance Balance and Mobility in People with Type 2 Diabetic Neuropathy	M. Rogers, PT, PhD, FAPTA; 7/1/14-6/30/17
Task-Specific Effects of Two Different Balance Training Regimens	J. Barton, PhD; 10/01/11- 09/30/16
Year 1 UM-OAIC Pilot Projects: 2011-2012	
Improving walking symmetry and functional mobility in stroke survivors with split-belt treadmill training.	A. Bastian, PhD/D. Hanley, PhD
Aerobic exercise (AEX) to improve regulation of Endothelial Progenitor Cells (EPCs) and Vascular Function in T2DM.	S. Prior, PhD
Effects of Vitamin D repletion (D) with and without multi-component lifestyle exercise training (MLife) on muscle function, inflammation and glucose metabolism in D deficient older adults	E. Streeten, MD/H. Ortmeyer, PhD
Resistance training (RT) and protein (Pro) supplementation to improve muscle physiology and reduce fatigue in breast cancer survivors	M. Serra, PhD
A high-density Electroencephalography (EEG) neural Decoding study of Dynamical Cortical Mapping of Gait in Humans after Stroke.	J. Contreras-Vidal, PhD
Year 2 UM-OAIC Pilot Projects: 2012-2013	
Comparison of Reactive Step Training and Voluntary Task-Oriented Training to Induce Neuromotor Changes for	D. Savin, PhD, MPT

Improving Balance and Preventing Falls	
Development of a Rehabilitation Strengthening and Mobility Program for Ventilator Dependent Older Patients	A. Verceles, MD/C. Wells, PhD, PT, CCS, ATC
Probing the Neural Basis and Influence of Cognitive Changes on Impaired Balance in Older Adults	K. Westlake, PhD
Using Self-Triggered, Sensory-Enhanced Gaze Shift to Improve Axial Turning Deficits in Persons with Parkinson's Disease	R. Creath, PhD
Year 3 UM-OAIC Pilot Projects: 2013-2014	
Early Mobilization of Older Adults after Emergency Surgery	L. Buchanan, MD
The Effect of Voluntary Exercise on Microglial Activation Phenotypes in the Aged Injured Brain	D. Loane, PhD
Year 4 UM-OAIC Pilot Projects: 2014-2015	
Ambulatory Activity in Elderly Patients in a Shock Trauma Center	I.Berges, PhD
Targeting Corticostriatal Plasticity for Parkinson's Disease Treatment	B.Mathur, PhD
Modulation of Interhemispheric Interactions and Arm Activity after Stroke	M. Dimyan, MD
Circulating MicroRNAs in Older Adults	J. Deiuliis, PhD
Multimodal Rehabilitation and High Protein Supplementation to Minimize ICU-Associated Sarcopenia in the Elderly	A.Verceles, MD/C. Wells, PhD, PT, CCS, ATC
Year 5 UM-OAIC Pilot Projects: 2015-2016	
Muscle and Functional Assessment in Leakage Study	T. Sanses, MD
The Development of a New Biomarker for the Diagnosis of Concussion	N. Badjatia, MD, MSc, FCCM
Towards Next-Generation Phenotyping in Parkinson Disease: Quantitative Analysis of Gait and Balance Using a Portable Biosensor Device	R. von Coelln, MD
Can Lateral Step Training Improve Initial Postural Adjustments in Stroke?	V. Gray, PT, PhD
Functional Benefit of Exercise Therapy after Endovascular Intervention in Older Patients with PAD	R. Kundi, MD

1. **Exercise and Weight Loss to Improve Mobility in Veterans with PAD**
   PI: O. Addison, D.P.T., Ph.D.
   VA CDA
   06/01/2016-05/31/2021

This study will determine whether weight loss and exercise will improve mobility function to a greater extent than exercise alone and determine the mechanisms underlying these improvements by measuring muscle microvascular perfusion, inflammation, quality and composition in older obese veterans with PAD.
Supported by RC 1, 2 and 3

2. **Modulation of Interhemispheric Interaction and Arm Activity after Stroke**
   PI: M. Dimyan, M.D.
   K23 NS088107
   07/01/2014-06/30/2019

The goal of this study is to investigate interhemispheric interaction dynamics across multiple time-points during arm muscle activity and determine the pathological changes that occur with aging and after stroke.
Supported by RC 1and 3

3. **Adaptive Ankle Robot Control System to Reduce Foot-Drop in Chronic Stroke**
   L. Forrester
   VA Merit
   06/01/2015-05/31/2019

In subjects with chronic stroke, this study will compare the effects of using an adaptive control system to integrate modular ankle robotic training with treadmill exercise vs. regular treadmill training without the robotic support. The hypothesis is that the robotics + treadmill approach will mediate greater gains in paretic leg propulsion, gait biomechanics, and balance control than the treadmill only approach.
Supported by 1, 2 and 3

4. **Improving Balance and Function in Older Veterans**
   PI: L. Katzel, M.D., Ph.D.
   VA SPIRE Pilot Study
   04/01/2015-03/31/2017

This VA SPIRE pilot study is a small randomized clinical trial comparing the effect of multimodality training versus Tai Chi on balance and functional performance on older adults at risk for falls.
Supported by RC 1, 2 and 3

5. **Exercise for Prevention of PTS through Enhanced Resolution of Thrombus**
   PI: B. Lal, M.D.
   VA Merit
   07/01/2014-06/20/2018

The goal of this study is to determine whether a therapeutic exercise program prevents post-thrombotic syndrome in patients with acute deep vein thrombosis, and to assess the effects of exercise therapy on fibrinolysis and thrombus resolution, as well as venous hemodynamics and exercise capacity.
Supported by RC 2

6. **Early Exercise to Improve Muscle and Cardiometabolic Health after Stroke**
   PI: R. Macko, M.D.
   R01 HD068712
   04/01/2011-03/31/2016

This study examines whether exercise started early after stroke can improve muscle structure and function and in so doing, improve cardiovascular health to prevent or reverse diabetes. We choose Jamaica as the study site because they have no rehabilitation (or exercise) after stroke, so we can truly understand the added benefits of exercise over best medical care, giving hope to stroke survivors and enabling us to know how to provide better care for our African-American minorities that suffer more from stroke in the U.S.
Supported by RC 2

7. **Community Ambulation Following Hip Fracture**
   PI: J. Magaziner, Ph.D., MS Hyg
   R01 AG035009-01A1
   09/01/2010-08/31/2017

This randomized controlled multi-center study will evaluate the effect of a 4 month, home delivered multi-component intervention on survival and the ability to ambulate independently in the community among older men and women who have sustained a hip fracture. The project also will investigate precursors to community ambulation and the cost effectiveness of delivering the program to this frail and disabled population of older persons.

Supported by RC 1, 2, 3

8. **The Effects of Multi-Modal Exercise Intervention Post Hip Fracture**
   PI: J. Magaziner, Ph.D., MS Hyg
   R37 AG009901
   09/01/2011-08/31/2018

The goal of this study is to evaluate some of the key mechanisms on the pathway to changes in community ambulation in response to a Multi-Modal Intervention delivered to this frail and disabled group of older persons. This is being done as an ancillary study to a Phase III randomized clinical trial (1R01AG035009).

Supported by RC 1

9. **Bringing Telemedicine to Maryland Skilled Nursing Facilities: Expanding Access to Care through an Academic, Clinical, and Telemedicine Consortium**
   PI: G. Ostir, Ph.D.
   CareFirst
   05/01/2016-04/30/2017

The purpose of the telemedicine program is to provide nursing home residents with access to emergency medicine expertise and resources via telemedicine consultation. Major objectives of the telemedicine program are to improve communications between health care providers and reduce potentially avoidable transfers of nursing facility residents to emergency departments.

10. **Exercise Training, CACs and Vascular Function in Older Veterans with IGT**
    PI: S. Prior, Ph.D.
    VA Merit
    10/01/2013-09/30/2017

This study tests the hypotheses that a) 6-month aerobic exercise training will improve circulating angiogenic cell (CAC) mobilization and function in older Veterans with IGT by increasing angiogenic growth factor levels and reducing inflammation and CAC oxidative stress, and b) the improvements in CAC mobilization and function will translate to better vascular function and insulin sensitivity in these older Veterans.

Supported by RC 1 and 2

11. **Post-Revascularization Rehabilitation to Improve Function in Veterans with PAD**
    PI: S. Prior, Ph.D.
    VA SPiRE
    01/14/2016-12/31/2017

This study will test the hypothesis that a supervised rehabilitation program will improve mobility function, ambulatory capacity, and QOL more than standard care, and these improvements occur through mechanisms including increases in angiogenesis, capillary density, and muscle perfusion in veterans with PAD after revascularization.

Supported by RC 2

12. Protective Balance and Startle Responses to Sudden Drop Perturbations in Aging
PI: M. Rogers, Ph.D., PT, FAPTA
R21 AG049615
08/01/2015-05/31/2017

The projects focus is on understanding the causes of age-associated falls and on the development of effective interventions for minimizing the devastating economic, societal, and personal consequences of falls among older people.

Supported by RC 1, 2, 3

13. Transmission of Antibiotic-Resistant Gram-Negative Bacteria (R-GNB) in Nursing Homes
PI: MC.Roghmann, M.D., MS
R03 AI122223
03/01/2016-02/28/2018

Healthcare associated infections (HAI) are common in nursing homes and are often caused by multidrug-resistant organisms (MDRO) such as MRSA and antibiotic resistant Gram-negative bacteria (R-GNB). These MDROs colonize residents and can be spread from resident to resident by healthcare personnel. The use of gowns and gloves can prevent this spread decreasing the risk of HAI; however, their use detracts from a home-like environment which is an important priority for nursing homes.

Supported by: RC 1

14. Resistive Training Combined with Nutritional Therapy after Stroke
PI: A. Ryan, Ph.D./F. Ivey, Ph.D.
VA Merit
05/01/2015-04/30/2019

This study tests the hypothesis that resistive training+protein supplementation will be more effective than resistive training+placebo for restoring lean tissue and stimulating muscle protein synthesis within the myostatin regulatory network in those disabled by stroke.

Supported by RC 1 and 2

15. Aerobic Training to Improve Energy Utilization and Antioxidant Capacity in Stroke
PI: M. Serra, Ph.D.
VA Career Development Award-2
04/01/2014-03/31/2019

This study examines how six months of treadmill and nutritional rehabilitation versus stretching control affects fatigue, metabolic flexibility, and local and skeletal muscle oxidative stress in chronic stroke survivors.

Supported by RC 1 and 2

16. Investigating Parkinson Disease Genetics in a Longitudinal PD Database
PI: L. Shulman, M.D.
Private Donor- Eugina Brin
07/01/2014-06/30/2018

The primary objective is to investigate the genetics of subtypes of Parkinson disease (motor, cognitive, behavioral). The secondary objective is to investigate patient and family attitudes about genetics analyses in PD and to explore best practices for patient-clinician communication about genetics testing.

Supported by RC 1

17. Non-Invasive Treatment of Abdominal Aortic Aneurysm Clinical Trial
PI: M. Terrin, Ph.D.
R01 AG037120
08/15/2011-07/31/2016
The primary aim of this multi-site clinical trial is to determine if doxycycline (100mg bid) will inhibit by at least 40% the increase in greatest transverse diameter of small abdominal aortic aneurysms over a 24-month period of observation in comparison to a placebo-treated control group.
Supported by RC 1

18. The Multimodal Rehabilitation of Older Ventilated Survivors of Critical Illness
PI: A. Verceles, M.D.
R03 AG045100
08/15/2013-07/31/2016
This pilot study tests the hypothesis that an MRP, which combines strength, endurance training, and functional retraining for older, mechanically ventilated survivors of critical illness, can improve functional mobility, strength, endurance, weaning from prolonged mechanical ventilation and discharge status compared to usual care in a long term acute care hospital facility mechanical ventilation weaning unit.
Supported by RC 1 and 2

19. Rehabilitation, NMES and High Protein to Reduce Post ICU Syndrome in the Elderly
PI: A. Verceles, M.D.
R21 AG050890
08/01/2015-07/31/2017
This study tests the hypothesis that preventive therapy involving the addition of neuromuscular electrical stimulation and high protein feeding to mobility-based physical rehabilitation program early and throughout the ICU hospital stay will mitigate PICS-associated sarcopenia, malnutrition, and immobility to confer valuable health benefits in older patients requiring mechanical ventilation.
Supported by RC 1 and 2

20. Driving Cortical Plasticity for Rehabilitation of Reaching after Stroke
PI: G. Wittenberg, M.D., Ph.D.
R01 HD061462
06/20/2011-04/20/2016
The parameters of TMS stimulation timing that best support practice related plasticity in the motor cortex will be determined.
Supported by RC 3

21. Neurophysiological and Kinematic Predictors of Response in Chronic Stroke
PI: G. Wittenberg, M.D., Ph.D.
VA Merit
07/01/2015-06/30/2019
This project will apply a single optimized intervention, robotic upper extremity training with repetitive task practice and measure predictive biomarkers for clinically significant improvement.
Supported by RC 3

C. PILOTS (Pilot Projects – Year 01 (1994) to Present)

Year 01 (1994-1995)

Effects of Exercise on Blood Pressure, Hyperinsulinemia and Renal Function in the Elderly
Donald R. Dengel, Ph.D., Research Associate (410) 605-7000 x5446 (Andrew Goldberg, M.D., Matthew Weir, M.D., Mentors)

Exercise Rehabilitation Programs for the Treatment of Claudication Pain
Andrew W. Gardner, Ph.D., Assistant Professor (410) 605-7000 x5426 (Eric Poehlman, Ph.D., Mentor)

Effect of Weight Loss and Exercise Training on Lipoprotein Lipid Metabolism in Elderly with Atherogenic LDL Phenotype
Leslie I. Katzel, M.D., Ph.D., Assistant Professor (410) 605-7000 x5422 (Andrew Goldberg, M.D., Mentor)

Costs of Congestive Heart Failure among the Elderly
Ernest Moy, M.D., MPH, Assistant Professor (410) 328-6598 (James Hudson, M.D., Mentor)

The Effects of Strength Training on Insulin Sensitivity and Glucose Tolerance in Post-Menopausal Women with Impaired Glucose Tolerance
Alice Smith Ryan, Ph.D., Research Fellow (410) 605-7000 x5449 (Dariush Elahi, Ph.D., Mentor)

Year 02 (1995-1996)

Cognitive Functioning of Hip Fracture Patients in the Hospital: Components, Predictors, Trajectories, Outcomes, and Implications for Intervention
Ann L. Gruber-Baldini, Ph.D., Research Associate (410) 706-2444 (Jay Magaziner, Ph.D., M.S. Hyg., Mentor)

Aerobic Exercise in the Elderly Stroke Population
Richard F. Macko, M.D., Assistant Professor (410) 605-7000 x0063 (Andrew Goldberg, M.D., Mentor)

Effects of Aerobic Exercise in Endogenous Fibrinolysis in Elderly Patients with Intermittent Claudication and Stroke
Lois Killewich, M.D., Ph.D., Assistant Professor (410) 605-7229 (William Flinn, M.D. and Andrew Goldberg, M.D., Mentors)

Assessment of Leg Perfusion in Intermittent Claudication
Andrew Gardner, Ph.D., Research Assistant Professor (410) 605-7000 x5426 (William Flinn, M.D., Mentor)

Year 03 (1996-1997)

The Effect of Risk Factor Modification (Diet, Weight Loss, Smoking Cessation, Exercise) on Endothelium-Dependent Brachial Artery Vasoactivity in Older Men and Women
Mary Corretti, M.D., Assistant Professor (410) 328-6190 (Stephen Gottlieb, M.D., Leslie Katzel, M.D., Ph.D., Mentors)

The Impact of Computer-Assisted Data Collection in a Geriatric Population
Roopak Manchanda, M.S. (410) 605-7000 x5430 and Mitchell Rosen, Ph.D. (410) 605-7119 (Douglas Bradham, Dr.P.H., Mentor)

Lower Extremity Strength in Vascularly Disabled Individuals: Peripheral Arterial Disease and Stroke
Kenneth Silver, M.D., Associate Professor (410) 328-6484 (Andrew Goldberg, M.D., James Hagberg, Ph.D., Mentors)

The Effect of Exercise on Recovery of Function Following Hip Fracture
Perry Colvin, M.D., Assistant Professor (410) 605-7217 (Jay Magaziner, Ph.D., Mentor)

Year 04 (1997-1998)

The Effect of Exercise on Recovery of Function Following Hip Fracture
Perry Colvin, M.D., Assistant Professor (410) 605-7217 (Jay Magaziner, Ph.D., Mentor)

The Effect of Risk Factor Modification (Diet, Weight Loss, Smoking Cessation, Exercise) on Endothelium-Dependent Brachial Artery Vasoactivity in Older Men and Women
Mary Corretti, M.D., Assistant Professor (410) 328-6190 (Stephen Gottlieb, M.D., Leslie Katzel, M.D., Ph.D., Mentors)

Electromagnetic Motor Evoked Potentials (MEPs) as a Prognostic Measure of Functional Outcomes in Stroke Patients
Gerald Smith, Ph.D., P.T., Assistant Professor (410) 706-7720 (Mary Rodgers, Ph.D., PT, Mentor

Year 05 (1998-1999)

Muscle Fiber Plasticity in Hemiparetic Patients after an Aerobic Exercise Program
Patrick DeDeyne, Ph.D., MPT, Assistant Professor (410) 706-2703 (Andrew Coggan, Ph.D., Mentor)

Analysis of Cardiac Na/Ca Exchanger During Aging
Abdul Ruknudin, Ph.D., Research Assistant Professor (410) 706-6240 (John Lederer, M.D., Ph.D., Mentor)

Upper Extremity Training in Stroke Patients: A Feasibility Study
Sandra McCombe-Waller, M.S., Clinical Instructor (410) 706-7720 (Jill Whitall, Ph.D., Mentor)

Year 06 (1999-2000)

Neuroplasticity and Upper Extremity Training in Stroke Patients
Larry Forrester, Ph.D., PT, Associate Professor (410) 706-5212 (Jill Whitall, Ph.D., Daniel Hanley, M.D., Gerald Smith, Ph.D., PT, Mentors)

Year 07 (2001-2002)

The Construct of a Hip Fracture-Specific Functional Test and Feasibility of a New Training Program
Gad Alon, Ph.D., PT, Associate Professor (410) 706-7733 (Perry Colvin, M.D., Jay Magaziner, Ph.D., M.S. Hyg., Mentors)

Short-term Neural Adaptations with Treadmill Training in Chronic Hemiparetic Stroke Patients
Larry Forrester, Ph.D., Assistant Research Professor/Research Associate (410) 706-5212 (Daniel Hanley, M.D., Richard Macko, M.D. Mentors)

Development of a Rodent Model Using Aerobic Exercise as Rehabilitative Intervention after Focal Cerebral Ischemia
Daniel Hanley, M.D., Professor (Johns Hopkins University) (410) 614-5185

Peripheral Arterial Occlusive Disease, Cognition, and Magnetic Resonance Abnormalities in Older Adults
Shari Waldstein, Ph.D., Assistant Professor (410) 455-2567 (Leslie Katzel, M.D., Ph.D., Eliot Siegel, M.D., David Lefkowitz, M.D., Abraham Obuchowski, M.D., Mentors)

Year 08 (2002-2003)

M**uscle Protein Profile in Patients with Stroke**
Patrick G. DeDeyne, Ph.D., M.P.T., Associate Professor (410) 706-2703 (Richard Macko, M.D., Mentor)

Progressive Rate Training (PRT) Post Stroke
Carwile LeRoy, M.D., Associate Investigator/Fellow (410) 605-7000 ext 5452 (Richard Macko, M.D., Mentor)

Assessing Treatment Fidelity in the Pepper Center: Enhancing Intervention Research
Denise Orwig, Ph.D., Assistant Professor (410) 706-2406 (Jay Magaziner, Ph.D., M.S. Hyg., Mentor)

Medical Cost Implications of Changes in Functional Status
Bruce Stuart, Ph.D., Professor (410) 706-5389

Central Motor Control Mechanisms Associated with Hand Dominance and Their Adaptability to Unilateral and Bilateral Training
Sandra McComb Waller, MS, PT, Assistant Professor (410) 706-0787 (Jill Whitall, Ph.D., Mary Rodgers, Ph.D., Mentors)

Year 09 (2003-2004)

Impedance-Controlled Ankle Robotics: A Novel Technology for Gait Rehabilitation after Stroke
Larry Forrester, Ph.D., Assistant Professor (410) 706-5212 (Richard Macko, M.D., Igo Krebs Ph.D., Christopher Bever, M.D., Mentors)

Age, Lifestyle, Muscle Mechanisms in Insulin Resistance (Training Only)
Lyndon Joseph, Ph.D., Assistant Professor, (410) 605-7000 ext 5783 (Alice Ryan, Ph.D., Andrew Goldberg, M.D., Mentors)

Morphometrical and Volumetrical Characteristics of the Lesioned Brain as Predictors of Therapeutic Benefits of BATRAC and AEX
Andreas Luft, M.D., Assistant Professor, University of Tübingen, Germany +49 7071 967853 (Daniel Hanley, M.D., Mentor)

Skeletal Muscle Size and Performance in HIV and Individuals of Differing Functional Status
David Russ, P.T., Ph.D., Assistant Professor, (410) 706-7165 (Les Katzel, M.D., Ph.D., Andrew Goldberg, M.D.)

Year 10 (2004-2005)

Adipose Tissue Production of Inflammatory Cytokines: Cellular Sources and Changes with Age
Jacob Blumenthal, M.D., Assistant Professor, (410) 605-7000 ext 5426 (Susan K. Fried, Ph.D. Andrew P. Goldberg, M.D.)

The Effects of Exercise on Renal Function as Measured by Cystatin C Versus Creatinine-based Estimates of Glomerular Filtration Rate
Jeffrey Fink, M.D., Associate Professor of Medicine, (410) 605-7000 ext 5280 (Les Katzel, M.D., Ph.D., mentor)

Does side of Stroke Affect Central Motor Control Mechanisms in Response to Short-term Unilateral Versus Bilateral Training?
Sandy McCombe Waller, Ph.D., PT, Assistant Professor, (410) 706-0787 (Jill Whitall, Ph.D., Daniel Hanley, M.D.)

The Effects of Resistive Training on Muscle Atrophy and Insulin Sensitivity in Hemiparetic Stroke Patients
Alice S. Ryan, Ph.D., Associate Professor, (410) 605-7851 and Fred Ivey, Ph.D., Assistant Professor, (410) 605-7297 (Richard Macko, M.D., Andrew P. Goldberg, M.D.)

Exercise Rehabilitation in Parkinson Disease
Frank Skidmore, M.D., Assistant Professor, (410) 299-1880 cell phone (Richard F. Macko, M.D., Lisa M. Shulman, M.D., William J. Weiner, M.D.)

Year 11 (2005-2006)

SAA Reduction as a Beneficial Mechanism of Weight Loss by Exercise
Da-Wei Gong, M.D., Ph.D., Assistant Professor (410) 706-1672 (Andrew P. Goldberg, M.D., Alice Ryan, Ph.D.)

Feasibility Study for the Measurement of Lower Extremity Muscle Strength, Muscle Composition and Cardiovascular Fitness Following Hip Fracture
Ram Miller, MDCM, MSc, Assistant Professor (410) 706-3907 (Jay Magaziner, Ph.D., Alice Ryan, Ph.D., Richard Macko, M.D., Charlene Hafer-Macko, M.D.)

Aging and HIV
Kris Ann Oursler, M.D., Associate Professor (410) 328-6056 (Les Katzel, M.D., Charlene Hafer-Macko, M.D.)

Effects of Ambulatory Exercise Training on Risk Factors for Sudden Cardiac Death in Stroke Patients
Eric Rashba, M.D., Associate Professor (410) 328-6056 (Richard Macko, M.D., Frederick Ivey, Ph.D.)

Cerebral Hypoperfusion and Cognitive Dysfunction in Chronic Kidney Disease (CKD)
Stephen Seliger, M.D. MS, Assistant Professor (410) 605-5231 (Shari Waldstein, Ph.D., Les Katzel, M.D., Ph.D., Jeffrey Fink, M.D., MS, Eliot Siegel, M.D.)

Year 12 (2006-2007)

The Effect of Treadmill Training on Recovery of Lower Extremity Function and Inflammatory Cytokines in Hip Fracture Patients
Ram Miller, MDCM, MSc, Assistant Professor (410) 706-3907 (Jay Magaziner, Ph.D., Alice Ryan, Ph.D., Richard Macko, M.D., Charlene Hafer-Macko, M.D.)

Mechanisms of Cellular Regeneration and Repair in the Functional Recovery of Skeletal Muscles from Older Animals Following Eccentric Injury
David Russ, P.T., Ph.D., Assistant Professor, (410) 706-7165 (Les Katzel, M.D., Ph.D., Andrew Goldberg, M.D.)

Short-Term Adaptations in Paretic and Lower Extremity Motor Control after Stroke: Bilateral Coupled Robots vs. Passive Manual Exercise.
Larry Forrester, Ph.D., Assistant Professor (410) 706-5212 (Richard Macko, M.D., Igo Krebs Ph.D., Christopher Bever, M.D., Mentors)

Year 13 (2007-2008)

Adaptive Physical Activity in Hemiparetic Stroke
Kathleen Michael, Ph.D., Assistant Professor (410) 605-4844 (Richard Macko, M.D., Andrew Goldberg, M.D., Mentors)

Effects of Aerobic Exercise Training on VEGF, Angiogenesis and Glucose Metabolism in Older Adults
Steven Prior, Ph.D. Assistant Professor (410) 605-4129 (Alice Ryan, Ph.D., Andrew Goldberg, M.D., Heidi Ortmeyer, Ph.D., Mentors)

Immunologic Dysfunction in Elderly Subjects who undergo Aerobic Exercise Rehabilitation
Wilbur Chen, M.D., Assistant Professor (410) 706-5328 (Andrew Goldberg, M.D., Alice Ryan, Ph.D., Mentors)

The Effect of Home-Based Exercise Training on Recovery of Lower Extremity Function and Inflammatory Cytokines in Hip Fracture Patients
Ram Miller, M.D.C.M., Assistant Professor (410) 706-2406 (Jay Magaziner, Ph.D., Les Katzel, M.D., Ph.D., Mentors)

Resistive Training and Skeletal Muscle Insulin Action in Hemiparetic Stroke Patients
Alice S. Ryan, Ph.D., Professor, (410) 605-7851 and Fred Ivey, Ph.D., Assistant Professor, (410) 605-7297 (Richard Macko, M.D., Mentor)

Year 14 (2008-2009)

Endothelial Function and Cognitive Dysfunction in Chronic Kidney Disease
Afshin Parsa, M.D., Ph.D., Assistant Professor, (410) 706-6445 (Les Katzel, M.D., Ph.D., Mentor)

Hip Muscle Composition: Relationships with Neuromechanical Performance, Lateral Stability, and Risk of Falls in Older Adults
Mark Rogers, Ph.D., P.T. Professor, (410) 706-0841 (Andrew Goldberg, M.D. and Alice Ryan, Ph.D. Mentors)

UM-OAIC & MERCE Joint Pilot Collaboration

Assessment of Motor System Connectivity in Stroke Rehabilitation
Alan McMillan, Ph.D., Research Associate, (410) 328-6104 (Jill Whitall, Ph.D., Mentor)

Year 15 (2009-2010)

Impact of Inflammatory Bowel Disease and Aging on Body Composition and Functional Performance
Raymond Cross, M.D., MS, Associate Professor, (410) 706-3387 (Les Katzel, M.D., Ph.D., and Alice Ryan, Ph.D., Mentors)

The Effects of Aging on Airway Smooth Muscle Contraction and Relaxation
Deepak Deshpande DVM, Ph.D., Assistant Professor, (410) 706-1070 (Andrew Goldberg, M.D., Mentor)

Task-Oriented Exercise and Behavioral Intervention to Promote Activity in Stroke
Kathleen Michael Ph.D., RN, CRRN, Assistant Professor, (410) 706-0142 (Richard Macko, M.D. and Andrew Goldberg, M.D., Mentors)

UM-OAIC & MERCE Joint Pilot Collaboration

Cortical and Biomechanical Dynamics of Lower Extremity Robot Assisted Training at Different Levels of Motivational Incentive Implications for Stroke Survivors
Ronald Goodman, Ph.D., Research Fellow, (410) 605-7000 ext. 4349 (Richard Macko, M.D. and George Wittenberg, M.D., Ph.D., Mentors)

Myasthenia Gravis Exercise Program to Increase Physical Activity and Fitness and Reduce Cardiovascular Risk
Charlene Hafer-Macko, M.D., Associate Professor, (410) 328-3100 (John Sorkin, M.D., Ph.D. Mentor)

Plasticity, Kinetics and Kinematics of Bilateral Reaching Therapy in Chronic Stroke
Lauren Jones-Lush, Ph.D., Assistant Professor, (410) 706-5490 (George Wittenberg, M.D., Ph.D., Mentor)

Year 16 (2010-2011)

Role and Mechanism of Exercise Induced Facilitation of Recovery after Experimental Traumatic Brain Injury
Alan Faden M.D., Professor, (410) 706-4205 (Richard Macko, M.D., Mentor)

Pilot Study of Prehabilitation Prior to Elective Surgery in Older Adults
Ram Miller M.D., CM, Assistant Professor, (410) 706-2406 (Jay Magaziner, Ph.D., M.S.Hyg, Mentor)

Effect of a Progressive, Adaptive Physical Activity Regimen on Functional Outcomes and Musculoskeletal Composition in Elderly Survivors of Critical Illness
Giora Netzer, M.D., MSCE, Assistant Professor, (410) 706-3344 (Michael Terrin, M.D., CM, MPH, Mentor)

Functional and Metabolic Benefits of Rehabilitation in HIV
Kris Ann Oursler, M.D., Assistant Professor, (410) 605-7000 ext.7194 & Heidi Ortmeyer, PhD, Assistant Professor, (410) 605-7000 ext. 5419 (Charlene Hafer-Macko M.D., Alice Ryan Ph.D., Andrew Goldberg, M.D., Mentors)

UM-OAIC & MERCE Joint Pilot Collaboration

Does Strength Training Improve Balance Training in Older Adults?
Brock Beamer, M.D., Assistant Professor, (410) 605-7000 ext. 4870 (Andrew Goldberg, M.D., Mark Rogers Ph.D., PT, Mentors)

Year 17 (2011-2012)

Improving Walking Symmetry and Functional Mobility in Stroke Survivors with Split-Belt Treadmill Training
Amy Bastian, Ph.D., Assistant Professor, (443) 923-2718, Johns Hopkins University, Inter-Pepper collaboration (Daniel Hanley, M.D., Mentor)

Aerobic Exercise (AEX) to Improve Regulation of Endothelial Progenitor Cells (EPCs) and Vascular Function in T2DM
Steven Prior, Ph.D. Assistant Professor (410) 605-7000 ext. 4129 (Alice Ryan, Ph.D., Andrew Goldberg, M.D., Heidi Ortmeyer, Ph.D., Mentors)

Effects of Vitamin D Repletion (D) with and without Multi-Component Lifestyle Exercise Training (MLife) on Muscle Function, Inflammation and Glucose Metabolism in D Deficient Older Adults
Elizabeth Streeten, M.D., Associate Professor, (410) 328-6219 and Heidi Ortmeyer, Ph.D., Assistant Professor, (410) 605-7000 ext. 5419 (Andrew Goldberg, M.D., Mentor)

Resistance Training (RT) and Protein (Pro) Supplementation to Improve Muscle Physiology and Reduce Fatigue in Breast Cancer Survivors
Monica Serra, Ph.D., Research Fellow, (410) 605-7000 ext. 4199 (Andrew Goldberg, M.D., Alice Ryan, Ph.D., Mentors)

A High-Density Electroencephalography (EEG) Neural Decoding Study of Dynamical Cortical Mapping of Gait in Humans after Stroke
Jose Contreras-Vidal, Ph.D., Professor, (713) 743-4429, University of Houston (Richard Macko, M.D., Larry Forrester, Ph.D., Mentors)

Year 18 (2012-2013)

Comparison of Reactive Step Training and Voluntary Task-Oriented Training to Induce Neuromotor Changes for Improving Balance and Preventing Falls
Douglas Savin, Ph.D., P.T. Assistant Professor, (410) 706-5210 (Mark Rogers, Ph.D., P.T., Mentor)

Development of a Rehabilitation Strengthening and Mobility Program for Ventilator Dependent Older Patients
Avelino Verceles, M.D., Assistant Professor, (410) 328-8141 (Andrew Goldberg, M.D. and Michael Terrin, M.D., C.M., M.P.H., Mentors)

Probing the Neural Basis and Influence of Cognitive Changes on Impaired Balance in Older Adults
Kelly Westlake, Ph.D., MSc., P.T., Assistant Professor, (410) 706-5919 (Mark Rogers, Ph.D., P.T., Shari Waldstein, Ph.D., Tula Adele, Ph.D., Rao Gullapalli, Ph.D., and George Wittenberg, M.D., Ph.D., Mentors)

Using Self-Triggered, Sensory-Enhanced Gaze Shift to Improve Axial Turning Deficits in Persons with Parkinson's Disease
Robert Creath, Ph.D., Assistant Professor, (410) 706-5918 (Mark Rogers, Ph.D., P.T., Mentor)

Year 19 (2013-2014)
Early Mobilization of Older Adults after Emergency Surgery
Laura Buchanan, M.D., Assistant Professor, (410) 389-1559 (Jay Magaziner, Ph.D., M.S.Hyg, Mentor)

The Effect of Voluntary Exercise on Microglial Activation Phenotypes in the Aged Injured Brain
David Loane, Ph.D., Assistant Professor, (410) 706-5188 (Richard Macko, M.D. and Daniel Hanley, M.D., Mentors)

Year 20 (2014-2015)
Ambulatory Activity in Elderly Patients in a Shock Trauma Center
Ivonne-Marie Berges, Ph.D., Assistant Professor, (410) 706-1379 (Jay Magaziner, Ph.D., M.S.Hyg, Mentor)

Targeting Corticostriatal Plasticity for Parkinson's Disease Treatment
Brian Mathur, Ph.D., Assistant Professor, (410) 706-8239 (Mark Rogers, Ph.D., P.T., George Wittenberg, M.D., Ph.D., Mentors)

Circulating MicroRNAs in Older Adults
Jeffrey Deiuliis, Ph.D., Assistant Professor, (410) 328-4096 (Alice Ryan, Ph.D., Mentor)

Modulation of Interhemispheric Interactions and Arm Activity after Stroke
Michael Dimyan, M.D., Assistant Professor, (410) 448-6345 (George Wittenberg, M.D., Ph.D., Mentor)

Multimodal Rehabilitation and High Protein Supplementation to Minimize ICU- Associated Sarcopenia in the Elderly
Avelino Verceles, MD, Assistant Professor, (410) 328-8141 (Andrew Goldberg, M.D. and Michael Terrin, M.D., Mentors)

Year 21 (2015-2016)
Muscle and Functional Assessment in Leakage Study
Tatiana Sanses, M.D., Assistant Professor, (410) 328-2385 (Alice Ryan, Ph.D., Mentor)
The primary aims of the study are to assess muscle quality and functional status in older women with urinary incontinence. Aim 1. To characterize functional status in women ≥ 70 years of age with symptoms of UI and correlate these findings with severity of UI. Hypothesis: Women with worse functional status based on specific objective evaluation will have worse symptoms of UI assessed by validated questionnaires. Aim 2: To phenotype women ≥ 70 years of age with symptoms of UI with respect to clinical, demographic variables, and pelvic muscle quality (levator ani, internal obturator) and gluteal (maximus, medius, and minimus) muscles by magnetic resonance imaging (MRI). Hypothesis: Women with decreased quality (atrophy and fatty infiltration) of pelvic floor musculature and lower extremities will have decreased functional status and worse symptoms of UI.

The Development of a New Biomarker for the Diagnosis of Concussion
Neeraj Badjatia, M.D., M.Sc., FCCM, Associate Professor, (410) 328-4515 (Alan Faden, M.D., Mentor)
Circulating microRNAs (miRs) have not yet been examined to determine if they can be used as biomarkers of concussion. miRs are a large class of endogenous, small, non-coding RNAs that regulate gene expression at the

post-transcriptional level and are thought to be involved in regulating expression of more than 30% of messenger RNAs. The expression of individual clusters of miRs appears to be cell and tissue specific and altered in disease specific patterns. Detectable levels have been isolated in serum, plasma, and cerebrospinal fluid. In the CNS the action of miRs have been shown to play key roles in neurodevelopment and are likely to be important mediators of plasticity as well as neurodegeneration. Specific to TBI, several recent studies in models of moderate and severe TBI have shown a differential expression of miRNAs corresponding to neurodegeneration and cell death. Studies from the Faden laboratory have further shown experimental evidence of a cluster, miR-711, that rise in blood plasma, mirroring time lapsed changes seen in injured cortex. Further experiments have demonstrated this miRNA cluster to be important regulators of neuronal apoptosis. We believe expression of miR-711 in plasma may represent a novel biomarker for the assessment of the neuronal injury associated with brain injury after concussion, and may aid in the future development of diagnostic and therapeutic interventions for concussion. We have begun a pilot study investigating the association between the miR-711 biomarker and clinical diagnosis of concussion in subjects age 21 – 50. This age range was originally chosen as a method by which to control for any impact aging may have on miR-711 expression; however, additional funding would allow us to assess the ability of this biomarker to 1) diagnose mild TBI in an aging population and 2) compare any age related - differences that may exist in the expression of miR-711. Our hypotheses for a cohort of elderly subjects, defined as age > 51 years old are noted below.
Hypotheses: 1) Non – hemorrhagic concussion (NHC) results in neuronal injury reflected by an acute elevation of plasma levels of miR-711; 2) The level of acute rise of plasma miR-711 after NHC corresponds to post concussive symptoms and cognitive deficits.
Aims: 1) To demonstrate an increase in plasma levels of miR-711 in within 6 hours of injury in subjects sustaining a NHC as compared to healthy controls; 2) To measure the association between plasma levels of miR measured within 6 hours of NHC and performance on post concussive questionnaires and cognitive testing as evaluated by the Rivermead Post Concussion Questionnaire12 and Montreal Cognitive Assessment (MOCA) Scale13, 14, respectively, 24 hours after injury.

Towards Next-Generation Phenotyping in Parkinson Disease: Quantitative Analysis of Gait and Balance Using a Portable Biosensor Device

Rainer von Coelln, M.D., Assistant Professor, (410) 328-7809 (Lisa Shulman, M.D., Mentor)

Impairment of gait and balance are key determinants of disability in PD. Clinical scales of PD symptom severity, including gait and balance, have been used to define motor subtypes of PD, e.g., the "Postural Instability and Gait Difficulty" subtype. However, these scales are limited by their subjective and semi-quantitative nature. Objective and quantitative analysis of gait and balance with a new generation of portable biosensor devices offers the opportunity to investigate mechanisms of disability due to gait and balance impairment in PD in great detail with minimal additional effort, compared to the standard clinical assessment. I propose to use a small light-weight portable whole-body biosensor device called Dynaport Hybrid for quantitative gait and balance analysis in PD. I will focus on the following aspects: 1) To establish re-test reliability of gait and balance measures performed with the Dynaport in PD patients; 2) to examine the Dynaport's potential to discriminate between levels of disease severity defined by conventional clinical scales; 3) to evaluate whether the Dynaport's potential to identify patients with increased risk of stumbling and falling is superior to conventional scales of PD severity.
The goal is to establish biosensor-based gait and balance analysis as a practical and valid tool in PD phenotyping. This project will provide preliminary data that will be instrumental for my application for an NIH career development award, focused on the use of biosensor-based phenotyping in refining motor subtypes and identifying PD phenotype-genotype correlations.

Can Lateral Step Training Improve Initial Postural Adjustments in Stroke?

Vicki Gray, P.T., Ph.D., Post-Doctoral Fellow, (410) 706-3778 (Mark Rogers, Ph.D., P.T., Mentor)

Sensorimotor and balance deficits after stroke increase risk of falling. Most falls after stroke occur during ambulation and transfers when weight is shifted laterally. There are an equal number of falls during planned voluntary actions as during unexpected disturbances, such as a slip, trip, or push. Balance is usually recovered with a protective step and the sensorimotor deficits impair one's ability to recover a loss of balance. We have previously found impairments in both voluntary and reactive reflex-like protective forward steps in people affected by stroke. It is likely the two forms of steps involve mechanisms that are differentially affected by a stroke. Current rehabilitation practices mainly focus on intentional voluntary actions rather than reactive balance training. Voluntary movements involve a cognitive component to plan and initiate the movement and low connectivity in the dorsolateral prefrontal cortex may inhibit motor learning. An increase in connectivity and activity of the primary motor cortex, primary sensorimotor cortex supplementary motor area brain stem and cerebellum midline may contribute to the motor recovery after stroke.

The purpose of this study is to compare the effects of two exercise training approaches, voluntary lateral step training and reactive lateral step training on lateral balance control in persons with chronic stroke, as assessed by an earlier initiation time of the center of pressure displacement and muscle activation of the leg and hip muscles, and a reduced response duration. Participants will also undergo functional MRI to determine if the anatomical connectivity, specifically the primary sensorimotor cortex, dorsolateral prefrontal cortex, primary motor cortex, and supplementary motor area, and the brain stem, and cerebellum midline can predict those individuals that will have motor gains after step training. The anatomical and functional connectivity of the primary sensorimotor cortex, dorsolateral prefrontal cortex, primary motor cortex, and supplementary motor area, and the brain stem, and cerebellum midline will be assessed after training to determine if those individuals in the reactive group show greater improvements in connectivity and activity in the brain stem, motor cortex and cerebellum. This research will provide improved understanding of the brain connectivity and motor changes that result from voluntary and reactive reflex-like training.

Functional Benefit of Exercise Therapy after Endovascular Intervention in Older Patients with PAD

Rishi Kundi, M.D., Assistant Professor, (410) 328-5840 (Brajesh Lal, M.D., Mentor)

Aim 1 will determine the effects of an exercise program implemented after endovascular intervention on lower extremity perfusion and patency of the revascularized lesion.

We will assess lower extremity perfusion and durability of the intervention compared to control over 6 months of follow-up. The primary outcome measures will be noninvasive vascular laboratory measurement of ankle-to-brachial index and primary patency of the revascularized lesion. Secondary measures will be digital perfusion pressure, segmental Doppler ultrasound waveform assessment, secondary patency, and reoperation rate

Aim 2 will determine the effects of post-intervention exercise therapy on physical function and quality of life in older adults with PAD.

We will achieve this by assessing physical function and quality of life in the intervention group over 6 months of follow-up. The primary outcome measure will be the short physical performance battery (SPPB), SF-36 and VascuQoL-6 score; secondary measures will be the modified PTT, walking impairment score (WIS) and initial and absolute distances to claudication during a treadmill test.

Aim 3 will examine vascular, angiogenic, and muscular mechanisms through which post-intervention exercise may improve perfusion, limb function, general functional capacity and quality of life.

A) We will determine treated artery flow and distal perfusion. Blood flow in the revascularized arterial segment will be assessed through contrast-enhanced Duplex ultrasound and MRI. Gastrocnemius needle biopsy will allow quantification of muscle capillarization and expression of VEGF and bFGF via RT-PCR and multiplex ELISA.

B) We will determine the effect of post-intervention exercise therapy on limb muscle mass, muscular strength, and muscle fiber size. Muscle mass will be assessed via DEXA scan and limb strength through exercise testing.

Needle muscle biopsy will allow quantification of myofibril size and strength and provide tissue for RT-PCR and Western Blot quantification of PGC-1α expression.
Collectively, the proposed studies will define the role of a program of supervised exercise following endovascular intervention for lower extremity arterial disease as a novel adjunct in older patients with peripheral arterial disease.

III. CAREER DEVELOPMENT
UM-OAIC Career Development Awardees and Subsequent Funding

Richard Macko, M.D., Professor, Neurology, Medicine/Gerontology, Physical Therapy and Rehabilitation Science University of Maryland School of Medicine & Baltimore VA Medical Center; Director, Academic Rehabilitation Program, UM-SOM , & the Maryland Exercise & Robotics Center of Excellence (MERCE)

- R29 AG014487 : Effects of Exercise on Patients with Hemiparetic Stroke
- RCDA Award: Physiological and Functional Effects of Task-Oriented Aerobic Exercise in Older Patients with Hemiparetic Stroke
- VA RR&D Merit Pilot Project: Adaptive Ankle Robot Control System to Reduce Foot-Drop in Chronic Stroke (Co-PI Forrester)
- VA Research Enhancement Award Program (REAP): Clinical and Translational Research in Stroke – Disability Reduction and Disease Prevention: Stroke Disability Reduction and Disease Prevention
- VA RR&D - VA Center of Excellence: Task-Oriented Exercise and Robotics in Neurological Disease
- Michael J. Fox DOPA 2006RFA: Treadmill Training and Gait Related Disability in Parkinson's Disease
- VA RRDC- Cardiovascular Parameters for Loomed Training in Chronic Incomplete Spinal Cord Injury
- VA RR&D/ VA Center of Excellence: Community Infrastructure for Adaptive Physical Activity Research
- R01 HD068712: Early Exercise to Improve Muscle and Cardiometabolic Health after Stroke (Co-PI Forrester)
- VA Office of Rural Health: eMOVE: Exercise + MOVE for Chronic Disease Management of Rural Veterans
- VA Office of Rural Health: Interactive Video Exercise Tele-rehabilitation (IVET)

Larry Forrester, Ph.D., Associate Professor, Department of Physical Therapy and Rehabilitation Science, University of Maryland Baltimore

- VA RR&D Merit Pilot Project: Adaptive Ankle Robot Control System to Reduce Foot-Drop in Chronic Stroke (Co-PI Macko)
- VA RR&D Merit Pilot Project: Developing a Brain Machine Interface for Ankle Robot
- P60 AG12583: Short-Term Effects of Treadmill Exercise on Corticoid-Spinal Excitability of the Lower Extremity in Chronic Hemiparetic Stroke Patients (Pilot Study)
- VA Advanced Career Development Award: Development of Ankle Robot Module with Treadmill Training in Chronic Stroke
- P60 AG12583: Impedance-Controlled Ankle Robotics: A Novel Technology for Gait Rehabilitation after Stroke (Pilot Study)
- VA RR&D Plasticity Center of Excellence: Adaptations in Cortical Function Induced by Short-Term Robot-Assisted Training of Foot Movements in Chronic Stroke Survivors (Pilot Study)
- P30 AG028747: Robot-Assisted Training of Ankle Movements in Sub acute Stroke Survivors (Pilot Study)
- University of MD College Park Seed Grant: Non-Invasive Real-Time Neural Decoding of Walking From EEG Activity

- VA RR&D Center of Excellence: Task-Oriented Exercise and Robotics in Neurological Disease

Marianne Shaughnessy, Ph.D., CRNP, Program Analyst, Office of Geriatrics Programs, Veterans Health Administration

- Maryland Statewide Health Network Grant through the Maryland Cigarette Restitution Fund Program Exercise and Diet Programs to Improve Cardiovascular Health in a West Baltimore Faith Community
- VA RR&D: VA Center of Excellence Pilot: Task-Oriented and Robotics in Neurological Diseases (PI Macko)
- VA Merit: Strength Training for Skeletal Muscle Adaptation after Stroke (Co-PI Ivey)
- VA Merit: Veterans with Stroke Translating Exercise Programs (VET STEP) (Co-PI Ivey)
- VHA: Delirium Toolbox Dissemination

Denise Orwig, Ph.D., Associate Professor, Department of Epidemiology and Preventive Medicine, University of Maryland Baltimore

- R01 AG028556: Biological Pathways of Acute and Chronic Stress in Aged Hip Fracture Caregivers (PI Fredman)
- R01 AG029315: Epidemiology of Bone Strength and Muscle Composition After Hip Fracture in Men (PI Magaziner)
- R37 AG009901: Effects of Multi-Modal Exercise Intervention Post Hip Fracture (PI Magaziner)
- U01 HL073958: Functional Outcomes in CV Patients Undergoing Surgical Hip Repair (FOCUS) (PI Carson)
- M01: RR016500: Multinational, multicenter, double-blind, randomized, placebo-controlled, parallel group study assessing the efficacy of intravenous zoledronic acid in preventing subsequent osteoporotic fractures after a hip fracture "HORIZON-RFT"
- R37 AG009901: Sequelae of Hip Fracture in Men: An Epidemiologic Study (PI Magaziner)

Frederick Ivey, Ph.D., Associate Professor, Department of Medicine, University of Maryland Baltimore

- VA Merit: Resistive Training Combined with Nutritional Therapy after Stroke (PI Ryan)
- K01 AG091242: Effects of Exercise on Endothelial Function in Chronic Hemiparetic Stroke Patients
- VA Career Development Award 2: Effects of Exercise on Endothelial Function in Stroke Patients
- VA Merit: Strength Training for Skeletal Muscle Adaptation after Stroke (Co-PI Shaughnessy)
- VA Merit: Veterans with Stroke Translating Exercise Programs (VET STEP) (Co-PI Shaughnessy)

Jacob Blumenthal, M.D., Assistant Professor, Department of Medicine, University of Maryland Baltimore

- VA-Advanced Research Career Development Award: Cytokines, Central Obesity and Fat Metabolism in Aging
- VA Merit: Using MOVE! With Seriously Mentally Ill (PI Goldberg)
- VA Merit Review: Exercise, Inflammation and Prothrombotic Modulators in the Elderly (PI Ryan)
- VHA- Patient-Centric Alternatives to Institutional Extended Care Project: Decreasing Barriers to Care for Veterans with Dementia
- VHA: Preventing Institutionalization and Supporting Caregivers through Expanded Services (PISCES)

Eun-Shim Nahm, Ph.D., RN, **FAAN**, Professor, Department of Organizational Systems and Adult Health, Program Director Nursing Informatics, School of Nursing, University of Maryland Baltimore

- R01 NR011296: Dissemination of a Theory-Based Bone Health Program in Online Communities
- R21 AG026013: Effects of a Hip Fracture Prevention Website for Seniors
- R21 AG029578: Feasibility of a Theory-Based Online Hip Fracture Resource Center for Caregivers

Kris Ann Oursler, M.D., Associate Professor, School of Medicine and Research Institute, Virginia Tech/ Salem VA Medical Center

- K23 AG024896: Aging and Physical Functioning in HIV (PI Oursler)
- R01: Assessment of Cardiac Tests in Vacs Exercise Study (PI: Freidberg)
- VA Merit: Effect of Exercise Training on Inflammation and Function in HIV Infected Veterans

Sandra McCombe-Waller, PT, Ph.D., MS, NCS, Associate Professor, Department of Physical Therapy and Rehabilitation Sciences, University of Maryland Baltimore

- P60 AG12583: Does Side of Stroke Affect Central Motor Control Mechanisms in Response to Short-Term Unilateral Versus Bilateral Training? (Pilot Study)
- R21 HD052125: Combining Bilateral and Distal Arm Training to Promote Arm and Hand Recovery in Patients with Chronic Hemiparesis

Kathleen Michael, Ph.D., RN, CRRN, Associate Professor, Interim Department Chair, Department of Organizational Systems and Adult Health, School of Nursing, University of Maryland Baltimore

- P60 AG12583: Task Oriented Exercise and Behavioral Interventions to Promote Activity in Stroke (Pilot Study)

Afshin Parsa, M.D., M.P.H., Associate Professor, Department of Medicine, University of Maryland Baltimore

- P60 AG12583: Endothelial Function and Cognitive Dysfunction in Chronic Kidney Disease (Pilot Study)
- R01 DK090401: Exercise Training and Cognitive and Physical Function in CKD (PI Seliger)
- U01 DK060990: A Genome-Wide Association of Renal Progression in the CRIC Study (PI Feldman)

Stephen Seliger, M.D., M.S., Associate Professor, Department of Medicine, University of Maryland Baltimore

- R01 DK090401: Exercise Training and Cognitive and Physical Function in CKD
- R01 AG034161: Race, Socioeconomic Status and the Brain: HANDLS Scan Substudy (PI Waldstein)
- VA Cooperative Studies Program: NEPHRON-D study
- VA Merit: Neurocognition and Functional Performance in Older Veterans with CKD

Steven Prior, Ph.D., Assistant Professor, Department of Medicine, University of Maryland Baltimore

- K23 AG040775: Effects of aerobic exercise on EPCs and vasculature dysfunction in Aging and T2DM
- R21 HL098810: Translational Studies of a Novel Cardiovascular Disease Risk Factor: Endothelial Progenitor Cells (Co-Inv, PI Hagberg UMCP)
- P30 AG028747: Aerobic Exercise to Improve Regulation of EPCs and the Vasculature in T2DM (Pilot Study)
- VA Merit: Exercise Training, CACs and Vascular Function in Older Veterans with IGT
- VA Career Development Award 2: Aging, Angiogenesis and Metabolic Responses to Aerobic Exercise
- P60 AG12583: Effects of Aerobic Exercise Training on VEGF, Angiogenesis and Glucose Metabolism in Older Adults (Pilot Study)

Monica Serra, Ph.D., Assistant Professor, Department of Medicine, University of Maryland Baltimore

- P30 AG028747: Resistance Training and Protein Supplementation to Improve Muscle Physiology and Reduce Fatigue in Breast Cancer Survivors (Pilot Study)

- VA Career Development Award 2: Aerobic Training to Improve Energy Utilization and Antioxidant Capacity in Stroke

Avelino Verceles, M.D., Assistant Professor, Department of Medicine, University of Maryland Baltimore

- R03 AG045100: The Multimodal Rehabilitation of Older Ventilated Survivors of Critical Illness
- P30 AG028747: The Multimodal Rehabilitation of Older Ventilated Survivors of Critical Illness (Pilot Study)
- P30 AG028747: Development of a Rehabilitation Strengthening and Mobility Program for Ventilator Dependent Older Patients (Pilot Study)
- R21 AG050890: Rehabilitation, NMES and High Protein to Reduce Post ICU Syndrome in the Elderly

Douglas Savin, Ph.D., M.P.T., Assistant Professor, Department of Physical Therapy and Rehabilitation Science, University of Maryland Baltimore

- P30 AG028747: Comparison of Reactive Step Training and Voluntary Task-Oriented Training to Induce Neuromotor Changes for Improving Balance and Preventing Falls (Pilot Study)

Michael Dimyan, M.D., Assistant Professor, Department of Neurology, University of Maryland Baltimore

- University of Maryland Baltimore County Seed Grant: Baseline Brain MR Imaging to Predict Response to Robotic Rehabilitation after Stroke (co-PI; co-PI M. Stuart)
- K23 NS088107: Modulation on Interhemispheric Interactions and Arm Activity after Stroke
- P30 AG028747: Investigating Brain Network Interactions in Stroke and Aging Using Concurrent Transcranial Magnetic Stimulation and Functional Magnetic Resonance Imaging (TMS-fMRI)(Pilot Study)

David Loane, Ph.D., Assistant Professor, Department of Anesthesiology, University of Maryland Baltimore

- P30 AG028747: The Effect of Voluntary Exercise on Microglial Activation Phenotypes in the Aged Injured Brain
- R01 NS082308: Microglial Activation Phenotypes and Mechanisms of Repair in the Aged TBI Brain

Tatiana Sanses, M.D., Assistant Professor, Department of Obstetrics and Gynecology, University of Maryland Baltimore

- P30 AG028747: Muscle and Functional Assessment in Leakage Study
- BIRCWH Institutional K12: Pelvic Floor Muscle Function in Aging Women with Pelvic Floor Disorders

Brian Mathur, Ph.D., Assistant Professor, Department of Pharmacology, University of Maryland Baltimore

- P30 AG028747: Targeting Corticostriatal Plasticity for Parkinson's Disease Treatment
- K22 AA021414: Targeting Corticostriatal Plasticity for Parkinson's Disease Treatment

Jeffrey A. Deiuliis, Ph.D., Assistant Professor, Department of Medicine, University of Maryland Baltimore

- P30 AG028747: Circulating MicroRNAs in Older Adults
- K01 DK099475: Adipose microRNAs (miRs) in Insulin Resistance

Danielle Beatty, Ph.D., Assistant Professor, Department of Psychology, University of Maryland Baltimore County
K01 AG043581: Race, Childhood Social Disadvantage, and the Adult Brain

IV. PUBLICATIONS

2015-2016

Addison O, Steinbrenner G, Goldberg AP, Katzel LI. Aging, Fitness, and Marathon Times in a 91 Year-Old Man Who Competed in 627 Marathons. Br J Med Med Res. 2015;8(12):1074-9. PubMed PMID: 26290832; PubMed Central PMCID: PMC4538980. [RC1,RC2,RC3, PESC]

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Chung S, Zhu S, Friedmann E, Kelleher C, Kozlovsky A, Macfarlane KW, Tkaczuk KH, Ryan AS, Griffith KA. Weight Loss with Mindful Eating in African American Women Following Treatment for Breast Cancer: A Longitudinal Study. Support Care Cancer. 2016 Apr;24(4):1875-81. PMID: 26463645. PMCID: NIHMS792576 [RC2]

Faden AI, Loane DJ. Chronic neurodegeneration after traumatic brain injury: Alzheimer disease, chronic traumatic encephalopathy, or persistent neuroinflammation? Neurotherapeutics. 2015 Jan;12(1):143-50. doi:

10.1007/s13311-014-0319-5. Review. PubMed PMID: 25421001; PubMed Central PMCID: PMC4322076 [PESC]

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V. EXTERNAL ADVISORY BOARD MEMBERS

Karen Bandeen-Roche, PhD — 5 years of service
Professor
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Johns Hopkins Bloomberg School of Public Health

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Arcadia University

Thomas M. Gill, MD — 10 years of service
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Translational Research Institute for Metabolism and Diabetes
Florida Hospital, Burnham Medical Research Institute

Alan M. Jette, PT, PhD — 10 years of service
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Brookdale Department of Geriatrics & Adult Development
Mount Sinai School of Medicine

Mark Redfern, PhD — 5 years of service
Co-Director, Medical Virtual Reality Center
Department of Otolaryngology
University of Pittsburgh

UM-OAIC Recognition and Awards
2015-2016

- **Mary Rodgers, P.T., Ph.D., F.A.P.T.A., F.A.S.B.** received the John H.P. Maley Award for Outstanding Contributions to Leadership in Research, Section on Research, American Physical Therapy Association

- **Mary Rodgers, P.T., Ph.D., F.A.P.T.A., F.A.S.B.** was elected Chair, Research-Intensive Physical Therapy Programs Consortium (RIPPT), Academic Council of Academic Physical Therapy (ACAPT)

- **Brian Mathur, Ph.D.** was elected President of the Society for Claustrum Research for a 2 year term
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- **Shari R. Waldstein, Ph.D.** was named the 2015-2016 Lipitz Professor of the Arts, Humanities, and Social Sciences at UMBC

- **Shari R. Waldstein, Ph.D.** was elected to the Executive Council of the Academy of Behavioral Medicine Research

UM-OAIC Minority Research
2015-2016

Ongoing Initiatives

Minority Trainees:

Anindo Roy, Ph.D., Assistant Professor, School of Medicine, Department of Physical Therapy and Rehabilitation Sciences, University of Maryland Baltimore

Dr. Roy continues to conduct research in rehabilitation robotics, focusing on the development of novel applications for MIT's newest Ankle Robot with Dr. Forrester in Pepper Center Core 3. He collaborates with Claude D. Pepper OAIC studies performing much of the on-site robot tests with Drs. Forrester, Macko and Wittenberg.

Derik Davis, M.D., Assistant Professor, School of Medicine, Department of Diagnostic Radiology and Nuclear Medicine, University of Maryland Baltimore

Dr. Davis' current research career is focused in musculoskeletal radiology examining the effects of increased visceral adipose tissue (VAT) and reduced skeletal muscle (SMM) on cardiovascular disease (CVD), diabetes and functional outcomes in older adults. He collaborates with Claude D. Pepper OAIC studies performing radiology imaging and reading with Dr. Alice Ryan.

Diversity/Minority Supplements:

PI: Jay Magaziner, Ph.D., M.S.Hyg.

Project Title: Effects of Multi-Modal Exercise Intervention Post Hip Fracture

3R01AG009901-17S1

The primary objective of the diversity supplement is to provide Rasheeda Johnson with a series of learning experiences to enhance her capabilities to perform as an independent investigator. Ms. Johnson will contribute intellectually to research on ambulatory ability after hip fracture by identifying issues of biomedical and clinical significance to aging research and through her own mentored project where she will investigate an important and understudied aspect of functional performance and mobility in older adults. During this project period, Ms. Johnson will investigate whether leg length discrepancy (LLD), a common complication following hip fracture surgery, is a possible mechanism that negatively impacts various health outcomes such as functional performance, hip and/or back pain, gait parameters and quality of life. This has tremendous potential for identifying a modifiable mechanism to improve ambulation and functional recovery after hip fracture that has not been previously studied.