Hebrew SeniorLife Institute for Aging Research
50th Anniversary Scientific Symposium & Poster Session

October 2, 2015
Harvard Medical School
Joseph B. Martin Conference Center
Boston, Massachusetts
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Dear Friends

The year 2015 marks the 50th anniversary of the Institute for Aging Research (IFAR). The visionary Social Research Department, that Murray May and Sylvia Sherwood, PhD started in 1965 to study how to serve the waiting list at Hebrew Rehabilitation Center for the Aged, has since grown into an internationally recognized, multi-disciplinary, Harvard-affiliated research program with 18 MD or PhD investigators, 4 Harvard Professors, 75 staff members, and $48 million in NIH grants.

IFAR has been at the forefront of geriatric research to improve the quality of life for seniors and has contributed to some of the most important innovations in senior care. We have shown that aging is not an inevitable decline and deterioration, and that many conditions once thought to be due to aging are, in fact, preventable or reversible through better diet, exercise, and other interventions.

Today, we will recognize and honor IFAR’s founders and feature special lectures by key figures from IFAR’s past. We will wrap up with a poster session highlighting our current research. We will re-connect with alumni, collaborators and supporters who have been an integral part of our history. We will have the opportunity not only to learn from each other, but also to advance collaborative research going forward.

For 50 years, IFAR has been challenging conventional wisdom to better understand how we age. The questions we ask—and the answers we uncover—directly impact standards of care and help seniors live more vital, meaningful lives.

Thank you for joining our celebration.

Lewis Lipsitz, MD
Professor of Medicine, Harvard Medical School
Chief of Gerontology, Beth Israel Deaconess Medical Center
Director, Institute for Aging Research, Hebrew SeniorLife
Dr. Sylvia Sherwood entered the field of Gerontology in the early 1960s, joining with the other luminaries of that era in laying the foundation for a new field of research in the social sciences. Among her contemporary colleagues were Powell Lawton, Ruth Bennett, Elaine Brody, Sidney Katz, Don Kent, George Maddox, and Robert Morris. For Sylvia, this new field was based on concern for the person’s life course, the service received, where a person lived, and the quality of their lives.

A graduate of the New York University, Medical Sociology Department, Sylvia and her late husband Clarence (Larry) Sherwood came to Massachusetts in the early 1960s and worked together throughout their careers as Sylvia tackled issues that focused on the changing status of elders in the community.

Murray May brought Sylvia into the Hebrew Senior Life (HSL) community fifty years ago and together they worked to pursue a vision in which hard research findings would inform policies about the role of institutions as well as home and community-based services that have since become the mainstream of governmental aging policy.

Sylvia’s initial research focus at the Hebrew Rehabilitation Center for Aged (as Hebrew SeniorLife was known then) was on an issue which has come to take center stage in the decades that followed: where should impaired seniors reside; at what level of impairment was it appropriate to have older persons enter a long-term care facility (nursing home); and what types of services might be required for such a person to remain in the community? As Sylvia began to ask these questions, President Johnson was poised to sign the legislation enabling the creation of both Medicare and Medicaid and we were just at the beginning of the massive expansion of nursing home beds made possible by Medicaid. HSL had just moved to a new campus in Roslindale (from the old home in Dorchester). Suddenly, even though there were over 200 new beds at its Roslindale campus, HSL found itself with over double that number of persons on a waiting list seeking admission. What to do, who to admit and how best to meet the needs of those awaiting admission, became the central issues. For Murray May and Sylvia Sherwood, the “what” became a support program (lead by social workers and nurses) to keep the applicants functioning.

Together, Murray May and Sylvia Sherwood worked to pursue a vision in which hard research findings would inform policies about the role of institutions and the home and community-based services that have since become the mainstream of governmental aging policy.

A Tribute to Sylvia Sherwood, PhD
in their communities. The “how” became a randomized control trial to ensure that HSL knew whether the program to sustain applicants in the community was effective. The program worked; those on the waiting list, who received support services, found community-based solutions to their liking and were much more likely (than persons in the control sample) to turn down an offer of admission to enter a nursing home bed in the new HSL Roslindale campus when their turn came.

“From Sylvia, I learned it was ‘OK’ to be both passionate and rigorous in pursuing a research question and in advocating for the poor and dependent elderly of the time.”
– Vince Mor

With this foundation, Sylvia and Murray agreed that Dr. Sherwood would establish and grow a formal research group inside of HSL, a program which was to become the premier such research institute in this country. On a structural level, this lead to the hiring of a number of individuals who went on to have distinguished careers in gerontology and geriatrics, including Drs. Lewis Lipsitz, Vincent Mor, and John Morris.

For Sylvia, this new position in an applied long-term care facility permitted her and her colleagues to focus their research on practical issues that affected persons as they aged. As Vince Mor said when accepting his own lifetime achievement award: “From Sylvia, I learned it was ‘ok’ to be both passionate and rigorous in pursuing a research question and in advocating for the poor and dependent elderly of the time.”

Sylvia quickly grasped that one key to elderly care was the importance of listening to the voice of the aged person. What did the person want? What services? What type of residential alternatives?

As the new Medicaid program in the US expanded the availability of nursing home beds, Sylvia became a leader in looking at alternatives to long-term institutional placements. It was clear to her that long-term community care depended on the support of the family and her research in Massachusetts and across the country looked at this phenomenon. What services did the frail elderly receive, what services did they need to which there was limited access?

Of even greater import, Sylvia came to see that if nursing home placement could be delayed, or elders’ return to the community expedited after a short, post-acute stay, the availability of appropriate housing would be key. With Dr. David Greer, then an active internist in Fall River who later became Dean of the Brown University Medical School, Sylvia carried out a landmark study which looked at how impaired persons could be supported in normal community housing that had support services built into the fabric of daily operations. Thus, did the Highland Heights study come into being. Well before the great expansion in assisted living that has so changed elder care in the last 30 years, they pioneered the notion that architecturally barrier-free housing with service enrichment could enrich the lives of the elderly and disabled, preventing or delaying permanent institutional placement. Their study empirically demonstrated that very impaired persons could thrive in a supportive community setting. Highland Heights became one of the first barrier-free public housing buildings for the elderly and disabled in the country – it became a model that others built upon.

At HSL, when faced with a demand to continue to grow, Sylvia’s work provided the foundation for a movement to create housing based alternatives. In the years that have passed, HSL has added five senior housing sites and two continuing care retirement communities.

Examining this phenomenon, Dr. Sherwood completed a series of landmark studies describing how elders age in place in a variety
of community settings, including their own homes, housing for the elderly, board and care, domiciliary care, assisted living, and continuing-care retirement communities. In a longitudinal study of Massachusetts elders, what stood out was the diversity of persons residing in the community -- from the very independent to the very impaired.

Sylvia found that residential mobility patterns differed by living setting. But in all settings, subsequent institutional placements were relatively rare, and many who entered a nursing home actually returned to the community. Informal support from family, friends and neighbors in most settings were found to be available, with help from these diverse sources beginning before loss of functional independence and escalating with increasing disability and varying by the level of support available in different types of housing settings. Based upon this body of research evidence, Dr. Sherwood joined with others in the field in highlighting the need for new service paradigms, focusing on the voice of the elder in different living settings. She described the role of “post-acute” care decades before it became part of the health care delivery system; she influenced the early developers of the concept of assisted living and championed the application of “de-institutionalization” to the elderly and nursing homes, all concepts that are fundamental to current universally accepted policies in support of home and community-based services.

As a mentor and leader, Sylvia demanded much from those around her and the results testify to her leadership. As a person, Sylvia has always been open and accessible, someone that others were pleased to call a friend. Care of the elderly is better because of her entry into the arena in the early 1960s. Her legacy is the research institute that Sylvia and Murray May began some 50 years ago. It represents the actualization of their vision that it was possible to perform the highest quality research with national and international reach in an applied setting, marrying the interests of the care delivery system for the elderly with advanced theory and research methods. Her career made a difference.

John Morris, PhD
Director of Social and Health Policy Research
Emeritus Director, Institute for Aging Research,
Hebrew SeniorLife

Vince Mor, PhD
Professor, Department of Health Services,
Policy, and Practice, Brown University
OCTOBER 2, 2015
Harvard Medical School, Joseph B. Martin Conference Center
Boston, Massachusetts

8:15a  Registration and Light Breakfast

9:00a – 9:40a  Welcome and Opening Remarks
LEWIS LIPSITZ, MD
Professor of Medicine, Harvard Medical School
Chief of Gerontology, Beth Israel Deaconess Medical Center
Director, Institute for Aging Research, Hebrew SeniorLife

Tributes to the Founders of Research at Hebrew SeniorLife

JEFFREY FLIER, MD
Dean of the Faculty of Medicine
Caroline Shields Walker Professor of Medicine
Harvard Medical School

MAURICE MAY, MS
President and CEO, Hebrew SeniorLife, 1962 - 2000

JOHN N. MORRIS, PHD
Director of Social and Health Policy Research
Director Emeritus, Institute for Aging Research, Hebrew SeniorLife

SYLVIA SHERWOOD, PHD
Director Emeritus, Institute for Aging Research, Hebrew SeniorLife

9:50a  Flashback: Hebrew SeniorLife as a Training Ground for Future Leadership in Aging
RICHARD BESDINE, MD, FACP
Professor of Medicine
Director, Division of Geriatrics and Palliative Medicine (Medicine)
Greer Professor of Geriatric Medicine
Alpert Medical School of Brown University;
Professor of Health Services Policy and Practice
Director, Center for Gerontology and Health Care Research
Brown University School of Public Health

10:15a  Three Decades of Long Term Care Research
VINCE MOR, PHD
Florence Pirce Grant University Professor
Professor, Department of Health Services, Policy, and Practice
Brown University
10:40a  BREAK

10:55a  The Vision of a Research Nursing Home
EVAN HADLEY, MD
Director, Division of Geriatrics and Clinical Gerontology
National Institute on Aging

11:20a  Identifying the Earliest Phase of Alzheimer’s Disease
MARILYN ALBERT, PHD
Professor of Neurology
Director, Division of Cognitive Neuroscience
Johns Hopkins School of Medicine

11:45a  Alzheimer’s Disease: Molecular Analysis is Leading to Disease-Modifying Treatments
DENNIS SELKOE, MD
Vincent and Stella Coates Professor of Neurologic Diseases
Harvard Medical School;
Co-Director, Center for Neurologic Diseases
Department of Neurology
Brigham and Women’s Hospital

12:10p  Lunch

1:00p  Keynote Presentation: Future Directions for Aging Research
JOHN ROWE, MD
Julius B. Richmond Professor of Health Policy & Aging
Mailman School of Public Health
Columbia University

1:25p  Population-based Studies of Aging
TAMARA HARRIS, MD, MS
Senior Investigator
Chief, Interdisciplinary Studies of Aging Section
Acting Co-Chief, Laboratory of Epidemiology and Population Sciences
National Institute on Aging, Intramural Research Program

1:50p  Brains vs. Brawn
MARIA FIATARONE SINGH, MD, FRACP
John Sutton Chair of Exercise and Sport Science
Convenor, Exercise, Health and Performance Faculty Research Group
Faculty of Health Sciences
Professor, Sydney Medical School
2:15p  Harnessing Motor-Cognitive Interactions to Improve Mobility in Advanced Age
JEFFREY HAUSDORFF, PHD
Professor, Sackler Faculty of Medicine and Sagol School of Neuroscience
Tel Aviv University;
Director, Center for the study of Movement, Cognition, and Mobility
Tel Aviv Medical Center

2:40p  BREAK

3:05p  Bringing Urinary Incontinence Out of the Closet
NEIL RESNICK, MD
Thomas Detre Endowed Chair in Geriatrics and Gerontology
Professor of Medicine and Chief, Division of Geriatric Medicine
Director, John A. Hartford Center of Excellence in Geriatrics
University of Pittsburgh and University of Pittsburgh Medical Center

3:30p  The Incontinent Mouse: Probing the Molecular Mechanisms of Urinary Incontinence
MARK ZEIDEL, MD
Herrman L. Blumgart Professor of Medicine
Harvard Medical School;
Chair and Physician-in-Chief
Beth Israel Deaconess Medical Center

3:55p  The Promise of Bioengineering in Solving the Challenges of Aging
JAMES COLLINS, PHD
Termeer Professor of Medical Engineering & Science
Professor, Department of Biological Engineering
Massachusetts Institute of Technology
Broad Institute of MIT and Harvard
Wyss Institute for Biologically Inspired Engineering, Harvard University

4:20p  Closing Remarks

4:30p – 6:00p  Scientific Poster Session and Cocktail Reception
Invited Speakers (In order of presentation)

RICHARD BESDINE, MD
Dr. Richard W. Besdine is Professor of Medicine, Director of the Division of Geriatrics and Palliative Medicine in the Department of Medicine, Chief of Geriatrics for Lifespan, and first Greer Professor of Geriatric Medicine at Alpert Medical School of Brown University. He is also Professor of Health Services Policy and Practice and Director of the Center for Gerontology Health-care Research in the Brown University School of Public Health. Dr. Besdine served as Interim Dean of Medicine and Biological Sciences at Brown Medical School (2002-2005). He is a founding Board member of the Rhode Island Quality Institute. He is past President of the American Geriatrics Society, and past chair of its Board of Directors. Dr. Besdine spent 1995-1998 in Federal service; he was Director of the Health Standards and Quality Bureau and first Chief Medical Officer for the Health Care Financing Administration (now CMS), responsible for setting standards, inspection, enforcement and improvement of health care quality for our nation’s 70 million Medicare beneficiaries and Medicaid recipients.

VINCENT MOR, PHD
Dr. Vincent Mor is the Florence Pierce Grant Professor of Community Health in the Brown University Public Health School and a senior health scientist in the health services research service at the Providence VA Medical Center. Dr. Mor was one of the founders of the Department’s graduate program in 1986 and directed the Center for Gerontology and Health Care Research for 10 years. He served as Chair of the Department of Community Health from 1996 until 2010 when the Department was transformed to a School. Dr. Mor has been Principal Investigator of over 30 NIH funded grants focusing on the use of health services and the outcomes frail and chronically ill persons experience. He was recipient of a Robert Wood Johnson Foundation health policy investigator award and a MERIT award from the National Institute on Aging and has evaluated the impact of programs and policies in aging and long-term care including Medicare funding of hospice, changes in Medicare nursing home payment and the introduction of quality measures. He was one of the authors of the Congressionally mandated Minimum Data Set (MDS) for Nursing Home Resident Assessment and was part of the team that developed and validated risk adjusted quality indicators for nursing homes versions of which now used in public reporting throughout the country.

EVAN C. HADLEY, MD
Dr. Evan Hadley is Director of the Division of Geriatrics and Clinical Gerontology at the National Institute on Aging (NIA), which supports research throughout the U.S. on clinical aging issues. He received his MD from the University of Pennsylvania and completed a research fellowship in NIA’s Gerontology Research Center in 1980. Since then, he has been responsible for developing NIA research programs on a variety of topics including menopause, physical frailty, clinical trials of interventions against disabling conditions, factors promoting healthy aging over the life span, and strategies to translate human genetic and physiologic aging research findings into interventions that preserve health and function in old age.
MARILYN S. ALBERT, PHD
Dr. Albert is Professor of Neurology and the Director of the Division of Cognitive Neuroscience in the Department of Neurology at the Johns Hopkins University School of Medicine. She is also the Director of the Johns Hopkins Alzheimer’s Disease Research Center.

Her major research interests are in the area of cognitive change with age, disease-related changes of cognition (with a particular focus on the early diagnosis of Alzheimer’s disease). Her research has focused on the relationship of cognitive change to brain structure and function, as assessed through imaging, cerebro-spinal fluid and other biomarkers. She has authored over 220 peer-reviewed publications.

DENNIS J. SELKOE, MD
Dennis Selkoe is the Vincent and Stella Coates Professor of Neurologic Diseases at Harvard Medical School and Brigham and Women’s Hospital. A graduate of Columbia University and the University of Virginia School of Medicine, he trained at the National Institutes of Health, the Harvard/Longwood Neurology Program and the Department of Neuroscience, Harvard Medical School (HMS). Dr. Selkoe and coworkers isolated the neurofibrillary tangles of Alzheimer’s disease (AD) and discovered their unusual insolubility and antigenic relationship to tau. He subsequently conducted extensive research on amyloid β-protein (Aβ) and its precursor (APP) and helped formulate a theory of AD causation, the “amyloid hypothesis”. In 1992, Dr. Selkoe and colleagues discovered that Aβ is produced by normal cells throughout life, enabling the dynamic study of Aβ generation and screens for Aβ inhibitors. The lab showed that mutations in APP and, later, presenilin cause AD by increasing Aβ production. Dr. Selkoe and his colleague, Michael Wolfe, identified presenilin as β-secretase, an unprecedented intramembrane aspartyl protease that processes APP, Notch and many other proteins in all metazoa. His lab has applied similar approaches to α-synuclein, the key misfolded protein of Parkinson’s disease. He has also focused on the translation of his discoveries on the cause and mechanism of Alzheimer’s disease into therapeutic approaches. His many scientific articles in Nature, Science, Neuron and other journals have provided the underpinnings of numerous disease-modifying trials currently underway.

JOHN W. ROWE, MD
Dr. John W. Rowe is the Julius B. Richmond Professor of Health Policy and Aging at the Columbia University Mailman School of Public Health. Previously, from 2000 until late 2006, Dr. Rowe served as Chairman and CEO of Aetna, Inc., one of the nation’s leading health care and related benefits organizations. Before his tenure at Aetna, from 1998 to 2000, Dr. Rowe served as President and Chief Executive Officer of Mount Sinai NYU Health, one of the nation’s largest academic health care organizations. From 1988 to 1998, prior to the Mount Sinai-NYU Health merger, Dr. Rowe was President of the Mount Sinai Hospital and the Mount Sinai School of Medicine in New York City.

Before joining Mount Sinai, Dr. Rowe was a Professor of Medicine and the founding Director of the Division on Aging at the Harvard Medical School, as well as Chief of Gerontology at Boston’s Beth Israel Hospital. He was Director of the MacArthur Foundation Research Network on Successful Aging and is co-author, with Robert Kahn, Ph.D., of Successful Aging (Pantheon, 1998). Currently, Dr. Rowe leads the MacArthur Foundation’s Network on An Aging Society.
TAMARA B. HARRIS, MD, MS
Dr. Tamara Harris is the Chief of the Interdisciplinary Studies of Aging Section, Laboratory of Population Science, Intramural Research Program at National Institute on Aging. She was one of the first scientists to implement large scale study of body composition, as identified by dual energy x-ray absorptiometry, bioelectrical impedance, and by computerized tomography, as a risk factor for disability and death. These measures have been incorporated into the Age, Gene/Environment Susceptibility-Reykjavik Study (AGES-Reykjavik) and the Health, Aging, and Body Composition Study (Health ABC) (which recruited a large proportion of African-American persons (42%) at baseline), and together these studies have a population of over 8,000 persons. Dr. Harris has written about and lectured on the topic of risks associated with obesity in older persons, about the interrelationships of muscle and bone, and on sarcopenia, especially with regard to risks related to morbidity in addition to those from mortality. She has now incorporated the study of health effects of low-level physical activity into her work using accelerometry.

MARIA FIATARONE SINGH, MD
Dr. Maria Fiatarone Singh, FRACP is a geriatrician, board certified in both Internal Medicine and Geriatric Medicine in the USA and Australia, who has held the inaugural John Sutton Chair of Exercise and Sport Science in the Faculty of Health Sciences, and Professorship, Sydney Medical School, at the University of Sydney since 1999. Her research, clinical, and teaching career has focused on the integration of medicine, exercise physiology, and nutrition as a means to improve health status and quality of life in older adults. She has had continuous substantial NIH funding from 1989-2004, and NH&MRC funding since 1999 when she moved to Australia, with a career total of over $40.3 million in grant funding. She has published extensively in the area of aging, exercise and nutrition, having authored/editied one book, authored over 175 peer-reviewed journal articles, and 100 peer-reviewed book chapters, position stands, and review articles. She has conducted clinical trials of exercise and nutrition in peripheral vascular disease, depression, frailty, osteoporosis, heart failure, osteoarthritis, hip fracture, renal failure, obesity, type 2 diabetes, sarcopenia, malnutrition, and vitamin D deficiency.

JEFFREY HAUSDORFF, PHD
Dr. Hausdorff is the Director of the Center for the study of Movement, Cognition, and Mobility at Tel Aviv Sourasky Medical Center and Professor in the Department of Physical Therapy at the Sackler Faculty of Medicine, and Sagol School of Neuroscience at Tel-Aviv University. Formerly an Assistant Professor at Harvard Medical School, Dr. Hausdorff served as the associate director of the Institute for Nonlinear Dynamics in Physiology and Medicine in Boston and as a research affiliate at MIT. He is an associate editor for the Journal of Gerontology Medical Sciences and the Journal of Neuro-Engineering and Rehabilitation, and frequently reviews for many journals. Dr. Hausdorff is also a board member of the International Society of Posture and Gait Research (ISPGR) and the International Society for the Measurement of Physical Behaviour. Dr. Hausdorff’s laboratory investigates the neural underpinnings of gait, postural control, falls and movement disorders in health (e.g., normal, aging, maturation) and pathology (e.g., Parkinson’s disease, post-stroke, Alzheimer’s disease). He and his research team have received widespread
recognition for their cutting edge work that integrates the fields of geriatrics, gerontology, neurology, physiology and engineering including awards from the American Geriatrics Society, IEEE, the American Physiological Society, the American Federation for Aging Research, Pervasive Computing Technologies for Healthcare, and the International Society of Posture and Gait Research. In 2013, Dr. Hausdorff was the recipient of the Gerontology Society of America's Excellence in Rehabilitation of Aging Persons Award.

NEIL M. RESNICK, MD

Dr. Resnick is the Thomas Detre Professor of Medicine, Chief of Geriatrics, and Director of the Hartford Foundation Center of Excellence in Geriatric Medicine at the University of Pittsburgh and UPMC.

Dr. Resnick has devoted his career to caring for older adults, to studying the causes of some of the conditions from which they suffer, and to trying to translate these discoveries into improved care. Before coming to Pittsburgh, he spent 15 years at Harvard, where he established the Gerontology Division at Brigham and Women’s Hospital, helped to create the Geriatrics Division at Massachusetts General Hospital, and launched the nation’s first Continence Center. His research has led to the discovery of a new disease, to novel ways for primary care physicians to care for incontinent individuals, and to guidelines for incontinent adults; the latter have been adopted by the U.S. government and the World Health Organization and implemented in all US nursing homes. Lessons from these studies also enabled him to conduct research into other common geriatric conditions, including prostatism, delirium, falls, and osteoporosis. However, apart from transforming nursing home regulations, knowledge from these studies had limited impact on practice. Thus, he has begun focusing on innovative ways to embed improved geriatric care into routine daily practice, and in 2012, he was selected as an Innovation Advisor to CMS/Medicare. His work has been funded for two decades by NIH, VA, CDC, and foundations, and he has published more than 200 articles and book chapters. He has also co-edited a leading geriatrics textbook and authored the chapter on geriatric medicine for several leading medical textbooks.

A graduate of Yale University and Stanford Medical School, Dr. Resnick has been honored by awards from the American Geriatrics Society, American Urological Association (AUA), International Continence Society, and NIH, and he has been included in the Best Doctors in America and America’s Top Doctors since their first editions.

MARK ZEIDEL, MD

Mark L. Zeidel, MD, is Herman L. Blumgart Professor of Medicine at Harvard Medical School and Chair of the Department of Medicine at Beth Israel Deaconess Medical Center in Boston. In his field, he has made multiple seminal observations: defining the role of atrial peptides in renal salt excretion, characterizing the biophysical function of water channels and barrier membranes, and advancing urothelial cell biology. His innovations in physiology teaching include an animated textbook, highly novel and nationally prominent week-long courses at the Mount Desert Island Biology Laboratories, and an upcoming series of review articles in his field’s major clinical journal. He has pioneered the provision of highly reliable, cost-effective care, both at the U Pitt and Beth Israel Deaconess Medical Center (BIDMC), and helped make quality care a major priority of Alliance for Academic Internal Medicine.

He has served on many regional and national committees and is recognized by his
peers for his numerous accomplishments, including elected membership to the American Society of Clinical Investigation and the Association of American Physicians.

JAMES J. COLLINS, PHD
James J. Collins is the Termeer Professor of Medical Engineering & Science and Professor of Biological Engineering at MIT, as well as a Member of the Harvard-MIT Health Sciences & Technology Faculty. He is also a Core Founding Faculty member of the Wyss Institute for Biologically Inspired Engineering at Harvard University, and an Institute Member of the Broad Institute of MIT and Harvard. His research group works in synthetic biology and systems biology, with a particular focus on using network biology approaches to study antibiotic action, bacterial defense mechanisms, and the emergence of resistance. Professor Collins’ patented technologies have been licensed by over 25 biotech, pharma and medical devices companies, and he has helped to launch a number of companies, including Sample6 Technologies, Synlogic and EnBiotix. He has received numerous awards and honors, including a Rhodes Scholarship, a MacArthur “Genius” Award, an NIH Director’s Pioneer Award, as well as several teaching awards. Professor Collins is an elected member of the National Academy of Sciences, the National Academy of Engineering, the National Academy of Medicine, and the American Academy of Arts & Sciences, as well as a charter fellow of the National Academy of Inventors.
The Aging Brain Center

The Aging Brain Center is dedicated to advancing medical knowledge about delirium, and the interface between delirium and dementias such as Alzheimer’s disease. Each year, more than 12 million older Americans develop delirium, an acute medical condition that presents as an abrupt confusion or as a sudden change in thinking abilities.

Our vision is to reduce delirium and its complications for patients worldwide. This mission is realized through high quality research studies and is supported by a dedicated staff, interdisciplinary collaborators and trainees in a supportive environment utilizing high-quality, innovative methods and technology.

**FACULTY**

**Sharon K. Inouye, MD, MPH**
Director, Aging Brain Center
Milton and Shirley F. Levy Family Chair
Professor of Medicine, Harvard Medical School, Beth Israel Deaconess Medical Center

**Eva M. Schmitt, PhD**
Associate Director, Aging Brain Center
Assistant Scientist I

**Tamara G. Fong, MD, PhD**
Assistant Scientist II, Aging Brain Center
Assistant Professor of Neurology, Harvard Medical School, Beth Israel Deaconess Medical Center

Head Circumference: A Useful Surrogate for Brain Volume in Older People by Magnetic Resonance Imaging (MRI)

Hshieh TT, Jones RN, Alsop D, Kosar C, Fox M, Inouye SK

**SCIENTIFIC ABSTRACT**

Dementia is a common, increasingly prevalent condition in older adults with significant morbidity and mortality. Intracranial volume (ICV) has been proposed as a predictive measure of cognitive reserve and dementia. Accurate measures of ICV currently require neuroimaging which is not feasible in all settings. Our goal was to assess the correlation of head circumference with total intracranial brain volume by Magnetic Resonance Imaging (MRI). Older adults (n=99) without clinical evidence of dementia underwent MRI. The participants were aged 70-87 years old (mean 76) and included 55 women, 44 men, of whom 9% were non-white or Hispanic ethnicity. ICV measured by MRI was highly correlated with head circumference. Head circumference and ICV were highly correlated overall (r = 0.75), and among both men (r = 0.75) and women (r = 0.61). Head circumference and total brain volume were also highly correlated overall (r = 0.72), and among men (r = 0.73) and women (r = 0.56). Our study provides support for use of a simple head circumference measurement in predicting ICV. It presents a novel approach that may advance future studies of cognitive function and reserve.
CEDARTREE: Program Development and Sustainability
Inouye SK, Tarbell N, Marcantonio E, Schmitt E, Blair-Brown A

SCIENTIFIC ABSTRACT
Over 2.5 million older Americans develop delirium (acute confusional state) each year, leading to substantial morbidity, mortality, and cost. Our purpose was to create the “Center of Excellence for Delirium in Aging: Research, Training and Educational Enhancement (CEDARTREE)” to advance delirium research and training. CEDARTREE, the first center of its kind in the nation, serves as a focal point for improving healthcare for older adults through the recognition, evaluation, prevention, and management of delirium. This program brings together world-renowned investigators in clinical-translational research, geriatrics/gerontology, and interdisciplinary resources to support the program, which stimulates research across the greater Boston academic community. The specific aims are to: 1) To create a comprehensive interdisciplinary training and mentorship program in delirium research; 2) To develop core resources to attract interdisciplinary investigators to engage in collaborative delirium-related research (e.g., website, research development grants, access to novel research technologies and databases, statistical/methodological expertise, and delirium bibliography); and 3) To serve as a local and national resource for research on delirium in aging through disseminating educational content, hosting a visiting scholar program, annual scientific symposium, and developing national linkages to translate evidence. Innovative approaches were incorporated at every level of the program including translational research on delirium (biomarkers, genomics, advanced neuroimaging), advanced statistical methods to address methodological challenges, and innovative educational strategies. Ultimately, our main goal is to translate research to improve clinical care, reduce preventable morbidity, and improve quality of life for older persons and their families.

Preoperative Pain: An Important Risk Factor for Postoperative Delirium
Tabloski PA, Kosar CM, Marcantonio ER, Jones RN, Schmitt EM, Puelle MR, Saczynski J, Inouye SK

SCIENTIFIC ABSTRACT
While previous studies have examined acute postoperative pain as a precipitating factor for delirium, the contribution of preoperative pain has not been previously examined. We examined chronic preoperative pain level as a predisposing factor for developing delirium. In an ongoing prospective cohort of 300 elective surgery patients, pain was assessed at baseline (preoperatively) as current, worst, and average level of pain within the last week, rated on a 0-10 scale (10=worst). The level of current preoperative pain in the sample was reported as mean = 2.1 ± 2.6 points. Of the 300 patients, 27% developed postoperative delirium based on Confusion Assessment Method criteria. Pain scores for 2 of the 3 pain measures were significantly associated with development of delirium, with a significant severity-response gradient for current pain (RR= 2.7, P <.01) and average pain (RR=2.1, P= 0.06). In unadjusted analysis, the relative risk of delirium increased by 11% per point of current pain. After adjustment for demographics, surgical type, co-morbidity and delirium risk, the relative risk was 12% per point, indicating the independent, incremental risk associated with preoperative pain. Unfortunately, analgesic medication data were not available for these analyses. This study indicates that higher levels of preoperative pain substantially increase the risk of developing postoperative delirium. This source of risk is distinct from other factors, and identifies a new predispos-
ing factor for delirium. Since pain is treatable, this study holds important implications for a new avenue of delirium prevention.

**Does Apolipoprotein E Genotype Increase Risk of Postoperative Delirium?**

Vasunilashorn V, Ngo L, Kosar C, Fong TG, Jones RN, Inouye SK, Marcantonio EM

**SCIENTIFIC ABSTRACT**

Given delirium’s association with dementia (particularly Alzheimer’s Disease [AD]), apolipoprotein E (ApoE) has been hypothesized as a genetic risk marker for delirium. The literature on ApoE and delirium, however, has been mixed. We tested the hypothesis that ApoE status is associated with postoperative delirium incidence, severity and duration. We examined non-demented patients age ≥70 years undergoing major non-cardiac surgery enrolled in the Successful Aging after Elective Surgery (SAGES) Study. We collected blood from all participants, extracted DNA and performed ApoE genotyping using the allele specific PCR assay method, considering ε4 vs non-ε4 carrier and ε2 vs non-ε2 carrier. Among the 272 patients (mean age 77 [standard deviation, SD 5.7], 57% female, 86% orthopedic), ApoE ε2 and ε4 was present in 16% and 20% of the sample respectively, and postoperative delirium occurred in 28%. In unadjusted models, ApoE ε4 and ε2 carrier status were not associated with postoperative delirium with relative risk [RR] for ε4=0.8, 95% confidence interval [CI] 0.5-1.4 and RR for ε2=1.1, 95% CI 0.7-1.8. The absence of an association remained after adjusting for age, sex, surgical procedure, and preoperative cognitive function. Among delirious patients, we similarly found no independent association between ApoE and delirium severity (ε4=1.4 point lower MDAS score, p=.32; ε2 carriers=2.2 point higher MDAS score, p=0.10) or delirium duration (ε4=0.2 fewer delirium days, p=0.51; ε2=0.2 more delirium days, p=0.65). Our findings indicate that ApoE genotype does not confer risk or protection in the development of postoperative delirium. Thus, in the non-demented older surgical population, an important risk factor for AD does not affect risk of delirium.

**Cognitive and Physical Contributions to Activities of Daily Living**

Wong B, Fong T, Habtemariam D, DeRooij S, Saczynski J, Gross A, Jones RN, Marcantonio E, Inouye SK

**SCIENTIFIC ABSTRACT**

Understanding the relative contributions of cognitive or physical ability for completion of a task can have profound implications for managing disability, predicting independence, and tailoring treatment in patients diagnosed with dementia. From a research perspective, knowing the differential impact of physical and cognitive contributions to functional outcomes may have different implications for the impact of a particular disease or for development of intervention strategies. A panel of multi-disciplinary health care providers rated the relative cognitive and physical demands of 16 activities taken from standard questionnaires of functional status (IADL, ADL, and the Medical Outcomes Study Short Form 12-item questionnaire, MOS SF-12). Convergent validity of the ratings was assessed by correlating items rated as most cognitively vs. most physically demanding with performance on neuropsychological and physical measures in a cohort of healthy older adults awaiting major elective surgery. Instrumental ADL items of managing money, self-administering medications, shopping, and using transportation were rated as having at least 1.5 times more cognitive than physical demand. Walking, transferring, completion of moderately strenuous activities, and climbing stairs were assessed as having at
least 1.5 times more physical than cognitive demand. Items rated as highly cognitive and highly physically demanding significantly correlated with objective measurements of neuropsychological (Pearson’s r=0.13-0.23, P<.05) and physical (Pearson’s r=0.15-0.46, P<.05) performance, respectively. By identifying relative cognitive and physical demands of specific functional tasks, we have provided a framework for using items from standardized functional and health status scales in potentially more sensitive way to provide optimal care in dementia populations.
Falls are the leading cause of death from injury among seniors. Risk increases with age, and one-in-three seniors fall each year. Of this group, 25 percent of those who fall suffer moderate to severe injuries, including hip fractures. By 2020, the annual direct and indirect cost of fall injuries is expected to reach nearly $55 billion. However, falls in seniors are largely preventable.

Our mission is to conduct research that will ultimately reduce the risk of falls and promote independent mobility as adults age. We work towards this mission as an interdisciplinary team by exploring cardiovascular, neurological, musculoskeletal, environmental and drug-related causes of falls and mobility disorders. This research has lead to the development of novel interventions that help older individuals overcome these conditions.

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**Re-examining the Effect of Antihypertensive Medications on Falls in Old Age**

Lipsitz LA, Habtemariam D, Gagnon M, Iloputaife I, Sorond F, Tchalla A, Travison TG

**SCIENTIFIC ABSTRACT**

**Background:** Conflicting data on the relationship between antihypertensive medications and falls in elderly people may lead to inappropriate under-treatment of hypertension in an effort to prevent falls. Therefore, we aimed to clarify the relationships between the chronic use of different classes of antihypertensive medications and different types of falls, determine the effect of medication dose, and assess whether falls risk is mediated by differences in cerebral blood flow.

**Methods:** We assessed demographics, clinical characteristics, and chronic antihypertensive medication use in 598 community-dwelling people with hypertension, aged 70 to 97. Falls were self-reported on monthly calendar postcards for one year and characterized by telephone interviews.

**Results:** Antihypertensive medication use was not associated with an increased risk of falls. Angiotensin Converting Enzyme (ACE) Inhibitors were associated with a lower risk of injurious falls (Odds Ratio = 0.62, 95% confidence interval = 0.39 - 0.96) and Calcium Channel Blockers with a lower risk of all falls (OR = 0.63, 95% CI = 0.43, 0.93) and indoor falls (OR = 0.57, 95% CI = 0.36, 0.91), compared to subjects not taking these drugs. Larger doses of these classes were associated with a lower risk of falls. Higher cerebral blood flow in subjects taking calcium channel blockers appeared to partially mediate the protective effect of these medications on falls risk.

**Conclusions:** Treatment of hypertension with
calcium channel blockers or ACE inhibitors may reduce falls risk. Calcium Channel blockers may do so by improving blood flow to brain regions critically involved in the control of mobility.

A Shoe Insole Delivering Subsensory Vibratory Noise Improves Balance and Gait in Healthy Elderly People
Manor B, Lough M, Niemi J, Travison TG, Howlett H, Lipsitz LA

SCIENTIFIC ABSTRACT
Background: The ability to maintain one’s balance depends upon numerous sources of sensory feedback, including somatosensory feedback arising from the soles of the feet. It is also known that low-level, sub-sensory mechanical vibrations applied to the soles of the feet can improve foot sole somatosensation. The objective of this study was therefore to test whether a novel piezoelectric vibratory insole improves balance, gait and mobility in relatively healthy older adults.

Methods: Twelve volunteers aged 65-90 years completed three separate study visits. Foot sole vibratory thresholds were determined at the beginning of each visit. Participants then wore the insoles, which delivered vibrations at 70%, 85% or 0% (i.e., the control condition) of sensory threshold, for the rest of the visit. During each visit, balance, gait and mobility were assessed three times: in the morning, mid-day and afternoon.

Results: The vibratory insoles significantly improved performance on the Timed Up-and-Go test of mobility, reduced the area of standing postural sway, and minimized the temporal variability of walking (p<0.05). These improvements were observed with vibrations at both 70% and 85% of sensory threshold, and were consistent throughout the course of a day.

Conclusions: This study provides proof of concept that the application of sub-sensory vibrations to the foot sole using a new low-voltage piezoelectric technology can improve measures of balance and gait that are associated with falls. Effective vibratory noise amplitudes range from 70% to 85% of the sensory threshold and can be set once daily.

Functional Implications of Muscle Co-contraction in Advanced Age: Effects of a Tai Chi Intervention.
Lo J, Olson E, Iloputaife I, Gagnon M, Habtemariam D, Manor B, Lipsitz LA

SCIENTIFIC ABSTRACT
Background: Co-contraction is the simultaneous activation of two opposing muscle groups during physical movement. While co-contraction may be used to adjust gait and balance, it may also induce fatigue, impair gait initiation, and increase fall risk in older adults. Thus, the relationship between co-contraction, gait, and balance in older adults is unclear. Our purpose was to determine if co-contraction is 1) associated with poor gait and balance and 2) modifiable with Tai Chi exercises.

Methods: Healthy older adults were randomized to a Tai Chi exercise program or an educational control group and were assessed for gait, standing balance, and their subjective feelings of balance confidence. Co-contraction levels were calculated from EMG signals collected from the anterior tibialis and lateral gastrocnemius muscles during walking. For the current analysis, groups were also divided into tertiles according to baseline co-contraction levels (low, moderate, and high).
**Results:** Across all participants at baseline, those with greater co-contraction levels during walking had worse gait, standing balance, and balance confidence (p<0.05). In order to examine the effects of Tai Chi intervention, the change in co-contraction from baseline to post-intervention was compared between similar tertiles of each group. As compared to the education intervention, Tai Chi practice reduced co-contraction levels, yet only for those who presented with moderate co-contraction levels (i.e., the middle tertile) at baseline (p<0.05).

**Conclusion:** These results indicate that 1) higher levels of co-contraction are related to worse gait, balance, and balance confidence, and 2) Tai Chi may reduce co-contraction during walking in older adults. This reduction in co-contraction may therefore underlie often-observed, Tai Chi-related improvements in both objective and subjective assessments of physical function.

**Transcranial Direct Current Stimulation (tDCS) Increases Brain Activation and Improves Balance in Healthy Older Adults**

Zhou J, Manor B, Jor’dan A, Ying H, Zhang J, Pascual-Leone A

**SCIENTIFIC ABSTRACT**

**Background:** Balance is regulated by a complex sensorimotor control system that includes numerous cognitive functions and underlying prefrontal brain networks. Transcranial direct current stimulation (tDCS), a non-invasive brain stimulation approach, modulates brain activity and induces acute improvements in both sensorimotor and cognitive function. We therefore hypothesized that a single session of tDCS targeting the prefrontal cortex would improve standing balance and increase brain blood flow in older adults.

**Methods:** To test this hypothesis, ten healthy older adults completed 4 study visits. On Visit 1 and 2, balance (i.e., postural sway) was measured while participants stood with eyes open, eyes closed, and while “dual tasking” (i.e., standing while performing verbalized serial subtractions). Balance trials were completed immediately before and after 20 minutes of either real or sham (i.e., control) tDCS. On Visit 3 and 4, arterial spin labeling MRIs were acquired to quantify resting-state brain perfusion, both before and after administration of tDCS as described above.

**Results:** Only real tDCS reduced the magnitude and speed of postural sway, particularly within the dual task standing condition (p<0.05). Moreover, real tDCS (but not sham) increased the perfusion of blood within several cognitive and sensorimotor brain regions (p<0.05).

**Conclusions:** These results indicate that a single session of noninvasive electrical brain stimulation improved standing balance and modulated underlying blood flow within the brain. Future studies are therefore needed to determine the potential for repeated bouts of tDCS to serve as a safe and low-cost balance rehabilitation therapy.
The overarching objective of the Musculoskeletal Research Center is to conduct research and disseminate findings on common musculoskeletal conditions of aging such as osteoporosis, osteoarthritis, hyperkyphosis (excessive forward curvature), sarcopenia (loss of muscle mass) and foot disorders, as well as biomechanics of the skeletal system. We promote interdisciplinary research to understand the mechanisms underlying musculoskeletal diseases. We test interventions to prevent the occurrence of disease, their progression and disabling outcomes in older adults. The Musculoskeletal Research Center is the home of the Framingham Osteoporosis Study, the Framingham Spine Health Study, and the Framingham Foot Study, which have contributed to the understanding of risk factors for fracture, hyperkyphosis and for foot disorders and pain.

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Visceral Adipose Tissue is Associated with Better Trabecular Density and Architecture But Increased Cortical Porosity: The Framingham Osteoporosis Study

SCIENTIFIC ABSTRACT
Obesity traditionally has been considered to protect the skeleton against osteoporosis and fracture because of mechanical effects of fat tissue as well as potential hormonal factors. Recently, body fat, specifically visceral adipose tissue (VAT), has been shown to be associated with lower BMD and increased risk for some types of fractures. Few studies have examined the associations between VAT, bone density and microarchitecture in cortical and trabecular compartments of the skeleton. Thus, we performed a cross-sectional study of VAT and bone microarchitecture in 381 participants (60% women) with average age 57.6 ± 7.4 yrs from the Framingham Offspring cohort to determine whether cortical and trabecular bone density and microarchitecture differ according to the amount of VAT.

VAT was measured from 8-slice multidetector CT imaging of the abdomen. Pixels containing fat (image display window width of -195 to -45 HU and a window center of -120 HU) were manually traced based on their position beneath the abdominal muscular wall. Bone density and microarchitecture parameters were measured at the tibia and radius using HR-pQCT (Scanco Medical AG). We focused on six bone parameters: cortical porosity (CtPo,%), cortical thickness (CtTh, mm), cortical bone area fraction CtA/TtA), trabecular density (TbBMD, mg/cm3), trabecular number (TbN, 1/mm), and total bone density (TtBMD, mg/cm3). To isolate the contribution of VAT to bone density and architecture, we calculated the ratio of VAT to body weight (WT) and used analysis of covariance to assess the association between quartiles of VAT/WT and density or microarchitecture. Analyses were repeated using quartiles of VAT. All analyses adjusted for sex, age, height (except for CtA/TtA), and in women, menopausal status. The average VAT was 1,977 ± 1013 cm3, and the average weight was 78 ± 16 lbs. At the radius and the tibia, CtTh and CtA/TtA increased across quartiles of VAT/WT (all p-trends <0.01). CtPo also increased by 8.2% at the radius (p-trend 0.06), but not at the tibia (p-trend 0.43). TbBMD, TbN, and TtBMD increased with greater VAT/WT at both the radius and tibia. When the analyses were repeated using quartiles of VAT, CtPo increased in the radius by 17% (p-trend 0.02) and in the tibia by 12% (p-trend 0.002) at the tibia. TbBMD and TbN generally while TtBMD did not.

Conclusion: Higher visceral adiposity is associated with greater total BMD, trabecular BMD and number, and greater cortical bone fraction, but also with greater cortical porosity. The finding that total density was positively associated with VAT/WT but not VAT may imply that weight increases total density while VAT affects cortical porosity. These complex effects on trabecular and cortical indices may partly explain prior observations of increased risk of fractures occur only at certain sites such as ankle and arm in obese individuals.

Race Interactions and Foot Function in Older Adults: The Johnston County Osteoarthritis Project
Hannan MT, Dufour AB, Golightly YM, Casey V, Hagedorn TJ, Riskowski JL, Hillstrom HJ, Jordan JM

SCIENTIFIC ABSTRACT
Purpose: Center of pressure excursion index (CPEI), a measure that characterizes pronation and supination, may be a useful indicator of foot function. Data from the predominantly
The Influences of Foot Structure and Function on Mobility Limitations in Older Adults: The Framingham Foot Study
Dufour AB, Katz PP, Golightly YM, Awale A, Han nan MT

SCIENTIFIC ABSTRACT
Background/Purpose: While lower extremity function is thought to affect mobility, little is known of the influence of foot structure or function upon mobility limitations. We evaluated the associations of foot structure and foot function with mobility limitations in community-dwelling older men and women.

Methods: Framingham Foot Study participants (2002-2008) with performance measures of mobility limitations were included in...
this cross-sectional analysis. Mobility limitations was assessed using the Short Physical Performance Battery (SPPB), a composite of 3 timed performance tests (4-meter walk (s), chair stands (s), and balance test) with each test scored on a scale of 0 to 4 (total score range 0-12, higher score = better function). Previously, SPPB scores have predicted physical limitations, disability and mortality. We dichotomized SPPB as 1-9 to indicate mobility limitations and 10-12 as good mobility. We also examined quartiles of chair stand and walk time. Foot function while walking (pronated, supinated, normal) and weight-bearing arch structure (low, high, normal arch) were defined using a Tekscan matscan pressure system. Age, sex, body mass index (BMI; <30, ≥30 kg/m2), current smoker (y/n) and depression (CES-D scale) were also obtained. Sex-specific multivariate logistic regression was used to calculate odds ratios (OR) and 95% confidence intervals (CI) for the association between foot structure and function with mobility limitations, adjusting for factors above.

Results: In 556 men and 700 women, average age was 70 yrs (±10.8) and BMI was 28 (±5.2). 16% had mobility limitations, 30% had high arched and 27% had low arched foot structure; 33% had pronated and 27% had supinated foot function. Foot function was not associated with mobility limitations. In women only, low arched foot structure was associated with increased odds of mobility limitations (SPPB; OR=2.27, p=0.005) after adjustment. No associations were seen between foot structure or function and chair stand time (ORs=0.8-1.1, all p>0.4). In quartiles of walk time, men in the 3rd quartile, compared to the lowest (fastest), were less likely to have a high arch foot structure (OR=0.53) and supinated foot function (OR=0.51). Women with a low arched foot were less likely to be in the 4th quartile (slowest walkers) compared to the fastest walkers and women with a pronated foot function were more likely to be in the 3rd quartile of walking speed compared to the fastest walkers.

Conclusion: Specific components of foot structure and function were associated with mobility limitations in our study, albeit with inconsistent patterns between men and women. Given these results, future work might examine specific regions of foot pressures and time-integral measures in order to drill down to biomechanical mechanisms.

Severity of Foot Pain is Linked to the Prevalence of Depressive Symptoms: The Framingham Foot Study
Authors: Awale A, Dufour AB, Katz P, Casey VA, Hannan MT

SCIENTIFIC ABSTRACT
Background: While a number of risk factors for foot pain are established, the relation between depression and foot pain has not been well studied. The purpose of this study was to examine the associations of foot pain and severity of foot pain with depressive symptoms in a population-based study of older adults.

Methods: A validated foot assessment and the 20-item CES-D questionnaire were administered to Framingham Foot Study (2002-08) participants. Age (years) and body mass index (BMI, kg/m2) were also collected. Foot pain was queried: “On most days, do you have pain, aching or stiffness in either of your feet?” Severity of foot pain was categorized as: none (referent), mild, moderate or severe pain. CES-D scores ≥ 16 were considered indicative of significant level of depressive symptoms. Sex-specific logistic regression was used to calculate odds ratios and 95% confidence intervals for the association of foot pain (y/n or severity of foot pain) with
depressive symptoms (y/n) adjusting for age and BMI. In a subset of participants, further models adjusted for leg pain (hip, knee, ankle), back pain, or other joint pain (neck, shoulder, elbow, wrist).

**Result:** Of the 3321 participants (mean age: 66 ± 10 years), 1464 were men (BMI: 28.9 ± 4.7 kg/m²) and 1857 were women (BMI: 28.0 ± 6.0 kg/m²). 21% men and 27% women had depressive symptoms (CES-D score ≥ 16). Men with moderate foot pain vs. none had 2-fold increased odds of reporting depressive symptoms; men with severe foot pain had a 4-fold increased odds, independent of age and BMI. Women showed a similar trend in which women with moderate foot pain had 2-fold increased odds of depressive symptoms, and women with severe foot pain had 3-fold odds, independent of age and BMI. For both men and women, mild foot pain showed increased odds (ratios of = 1.3 and 1.4 respectively), but was only statistically significant for women (p = .046). Models considering other regions of pain attenuated the odds ratios pain variables were non-significant for men, but was only statistically significant for women (p = .007), other pain (p = .019) but not leg pain (p = .775) added to the model.

**Conclusion:** Severity of foot pain, adjusting for age and BMI, was significantly associated with the prevalence of depressive symptoms in our study (i.e., those reporting worse foot pain were more likely to report depressive symptoms). Adding joint pain at other regions attenuated, but did not change the pattern of results. Future studies should investigate the longitudinal aspects of the severity of foot pain and depressive symptoms in older adults.

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**Brown Adipose Tissue (BAT) Activity is Inversely Associated With Bone Mineral Density (BMD) in Healthy Young Adults**

*McLean RR, Weiner L, Cypess A, Kiel DP*

**SCIENTIFIC ABSTRACT**

Brown adipose tissue (BAT), previously thought to disappear after infancy, but recently identified in adults, generates energy through calorie consumption (thermogenesis) with cold exposure. Mouse models suggest both positive and negative associations between BAT and bone formation, and it is hypothesized that impaired BAT activity may contribute to bone loss by increasing sympathetic activity (e.g. higher heart rate). Evidence of a link between BAT and BMD would suggest BAT activation as a novel bone mass intervention. To date, only 2 human studies found positive associations in anorexic women and healthy, young women but not men. The objective of this study was to determine the association between BAT activity and BMD in healthy adults. We hypothesized that BAT activity is positively associated with BMD. Among nine (4 men, 5 women) young (age range 20-31 years), healthy volunteers (BMI range 19-29 kg/m²), BAT activity was measured by PET-CT after 2 hours of cold exposure. There was an unexpected negative correlation between BAT activity and BMD (r=-0.72, P=0.03). BAT was also negatively correlated with age (-0.58, P=0.09), but was not correlated with BMI, fat mass or fat free mass. BMD was positively correlated with age (r=0.74, P=0.02). After age adjustment, there was no statistically-significant association between BAT activity and BMD (β=-0.0009, P=0.18), and results were similar after adjustment for BMI, fat mass and fat free mass. These results suggest that increased BAT activity may be associated with lower BMD in young, healthy adults. Larger studies of longitudinal changes in BMD that include
adults across a wider age range are needed to determine whether BAT may have a mechanistic role in bone loss.

High Serum Uric Acid Concentration Show Different Association Between Vitamin C Intake and Spine Quantitative Computed Tomography (QCT) Bone Measures in Women. Sahni S, Tucker KL, Fox C, Kiel DP, Hannan MT

SCIENTIFIC ABSTRACT
Higher Vitamin C intake has been associated with lower serum uric acid (sUA) concentration and less bone mineral density (BMD) loss over time. sUA (an antioxidant within normal range: 3-7mg/dL) has been associated with higher BMD. However, at elevated concentration, sUA can act as a pro-oxidant, contributing to inflammation. Thus, we examined the association of vitamin C intake with QCT volumetric measures of bone [vBMD (g/cm3), integral and trabecular vBMD], cross-sectional area (CSA, cm2) and vertebral compressive strength (VCS, N) at the L3 level of the spine in men and women from the Framingham 3rd Generation Cohort. Associations were further examined within categories of normal sUA (≤7 men; ≤6mg/dL women) and high sUA. In this cross-sectional analysis of 802 women and 965 men (ages 32-72y), diet, sUA and QCT bone measures were obtained in 2002-05. Sex-specific linear regression was used to calculate beta coefficients and standard errors, adjusting for covariates. Interactions of vitamin C intake and sUA were tested. If significant (P<0.10), associations were examined by sUA subgroup. Mean ages were 44(±6)y in men and 46(±6)y in women. Mean vitamin C intakes (mg/d) were 240 (men) and 271 (women). Mean sUA (mg/dL) were 6.28(±1.24) (men) and 4.44(±1.09) (women). Significant interactions of sUA and vitamin C intake were seen for CSA (P range=0.005-0.06). Among women with sUA>6 mg/dL, higher vitamin C was associated with higher integral vBMD (P=0.005), trabecular vBMD (P=0.02) and VCS (P=0.01), but these were not significant in women with lower sUA. No significant associations were seen in men. Although the sample size was limited in women with high sUA (n=53), this study suggests that higher vitamin C intake may be protective of bone in women with high sUA. The sex differences observed could be due to higher vitamin C intake in women compared to men. Future work should examine vitamin C and sUA in relation to QCT bone changes over time.

Deficits in Cortical Bone Density and Microstructure in Type 2 Diabetes: Framingham HR-pQCT Study
Samelson EJ, Bouxsein ME, Broe KE, Zhang X, Meng C, Hogan M, Carroll D, McLean RR, Hannan MT, Cupples LA, Fox CS, Kiel DP

SCIENTIFIC ABSTRACT
Background: Risk of fracture, particularly at the lower leg, is 2-fold higher in older adults with type 2 diabetes (T2D), despite having normal or increased areal BMD, relative to those without T2D. Since DXA underestimates fracture risk in T2D patients, new methods are needed to identify skeletal fragility in this vulnerable population. Evidence from small clinical studies of postmenopausal women suggests T2D is associated with deficits in cortical microarchitecture. We conducted a community based study of men and women to compare bone microarchitecture by HR-pQCT between those with and without T2D, and determine the association between bone microarchitecture and HbA1C level.
Methods: This study included 627 members (367 women, 260 men) of the Framingham Offspring Cohort, who attended a baseline examination (2005-08), including evaluation of T2D and A1C, and underwent HR-pQCT scanning at the tibia and radius 6 yr later. T2D was defined as glucose >126 mg/dl or use of T2D medication. A1C (%) was measured from morning fasting blood. Linear regression was used to calculate means and correlations for the association between volumetric bone density (vBMD), geometry, and microstructure indices of trabecular and cortical bone and T2D and A1C, adjusted for age, sex, and weight.

Results: Mean baseline age was 65 yr (range, 45-84) and included 71 cohort members (40 men, 31 women) with T2D. At the tibia, total and trabecular vBMD and number were higher in those with T2D than those without T2D; however, the differences were not significant. In contrast, persons with T2D had significantly lower cortical vBMD and higher cortical porosity. A similar pattern was seen with increasing A1C level: trabecular indices were better with increasing A1C but cortical bone indices were worse, although significance was limited to trabecular number. There were no other differences in HRpQCT bone indices in those with and without diabetes or by A1C level. At the radius, we found no significant association between bone HRpQCT indices and T2D or A1C.

Conclusion: In this community-based study of women and men, we showed that T2D and increased A1C are associated with deficits in cortical microstructure and density at the distal tibia. It remains unknown whether deficits in cortical bone explain increased fracture risk observed at the lower leg in diabetes. These results help to identify areas to target for investigation of the mechanism responsible for skeletal fragility in diabetic bone.

Prospective Study of Kyphosis and Lower Extremity Function in Women and Men: The Framingham Study

Lorbergs AL, Zhou Y, Meng C-A, Brochin E, Kiel DP, Cupples LA, Murabito JM, Anderson DE, Allaire BA, Bouxsein ML, Travison TG, Samelson EJ

Scientific Abstract

Increased thoracic kyphosis is a spinal disfigurement manifested as a hunched posture. In older women, greater kyphosis is associated with mobility deficits, yet the effect on risk of poor mobility in men is not known. We conducted a prospective study to determine the contribution of baseline kyphosis angle (KA) on performance-based measures of physical function at 6y follow-up in a community-based population of women and men. Participants included 808 cohort members (447 women, 361 men) with mean age 64y (range, 50-85y) of the Framingham Offspring Study. Baseline (2002-2005) lateral CT images were used to measure kyphosis (T4-T12 Cobb angle, degrees), where greater KA indicates greater forward curvature. At 6y follow-up, participants performed 5 chair stands without using arms and a fast 4m walk. We used linear models to estimate mean chair stand time (s) and gait speed (m/s) at follow-up by sex-specific quartiles of baseline KA. We conducted stratified analysis to evaluate whether the contribution of greater KA to performance measures differed by age (<65, ≥65y). Mean (SD) baseline KA, chair stand time, and gait speed were 33(9)°, 5.9(1.5)s, and 1.6(0.3) m/s for women and 30(9)°, 6.0(1.5)s, and 1.8(0.4) m/s for men, respectively. Women with greater KA at baseline took longer to perform 5 chair stands (trend, p=0.009) and had slower gait speed (trend, p=0.038) at follow-up. After adjusting for baseline age, height, weight, and smoking, the association between greater KA and longer chair stand
time remained significant (trend, p=0.024), whereas the association with gait speed was no longer significant (trend, p=0.52). In men, greater KA at baseline was not associated with poor physical function at follow-up. Finally, the results were similar in age <65 and ≥65y (not shown). Women with greater kyphosis performed chair stands more slowly at 6y follow-up (0.3s slower per 10⁰ increase in KA). Sit-to-stand transitions require a high rate of knee extensor torque development; thus, greater kyphosis may be associated with reduced muscle power. Functional limitations are observed at older ages in men than women. The relatively young age of older adults in our sample may have limited the ability of our study to detect associations in men. Alternatively, accentuated forward curvature may pose greater challenges for women during rapid shifting of the center of mass due to weaker lower extremity muscles.
Palliative care is focused on relieving the pain and discomfort of patients with chronic and life-limiting illnesses. Our goal is to conduct high-quality clinical and health services palliative care research that will improve the quality of care provided to older patients and their families.

The program has a specific focus on research into palliative care provided to older adults and their families in the long-term care setting and related to advanced dementia.

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**PROVEN: Pragmatic Trial of Video Education in Nursing homes**  
Mitchell SL, Mor V, Volandes A

**SCIENTIFIC ABSTRACT**

**Background:** Nursing homes (NHs) are complex health care systems that serve increasingly sick patients with advanced comorbid conditions. NHs are often charged with guiding these patients through decisions about the direction of their treatment. Identifying effective approaches that NHs can use to better promote goal-directed care and optimize resources, is a research, public health, and clinical priority. Advance care planning (ACP) is the most consistent modifiable factor associated with better palliative care outcomes. Traditional ACP relies on verbal descriptions of hypothetical health states and treatments. This approach is limited because complex scenarios are difficult to envision, counseling is inconsistent, and verbal explanations are hindered by literacy and language barriers. To address these shortcomings, we developed ACP video decision support tools and have shown their efficacy in small randomized controlled trials (RCTs). Purpose: The overall objective of this proposal is to conduct a pragmatic cluster RCT to evaluate the effectiveness of ACP video decision support tools in two large NH health care systems.

**Methods:** The cluster RCT will be conducted in NHs (N=230; 115/arm) across the US owned by Pruitt and Genesis Health care. Over an 18-month period, a suite of ACP video decision support tools will be implemented facility-wide in the intervention NHs. Control NHs will employ their usual ACP practices. All outcomes will be assessed using established data sources, namely, state-of-the-art electronic medical records linked to Medicare and Minimum Data Set databases.
AIMS: Outcomes will be compared in the intervention vs. control NHs among 3 patient groups; i. long-stay residents with targeted advanced chronic illnesses (dementia, heart failure, and chronic obstructive lung disease) (Aim 1), ii. post-acute care admissions with these advanced illnesses (Aim 2), and iii. all other NH patients without the targeted advanced illnesses (Aim 3). Outcomes will include: 1. hospital transfers, 2. advance directives, 3. other burdensome treatments, and 4. hospice use. Hospitalization over 12 months in the long-stay advanced illness cohort is the primary trial outcome.

Impact: NHs serve the most frail and vulnerable patients. Interventions to deliver more patient-focused, cost-effective care in this setting are needed. Better ACP offers an opportunity to improve NH care. Video decision support is a practical and innovative approach to uniformly provide ACP. This work has the potential improve the care provided to millions of older Americans in NHs and enable future pragmatic trials in this setting.

Advance Care Planning in Dementia

SCIENTIFIC ABSTRACT
Background: Despite exceptional need, ACP in dementia is inadequate. A major barrier is lack of knowledge about patient and family readiness to engage in ACP. We need a better understanding of how, when and with whom ACP can be conducted.

Methods: A cross sectional survey, in three outpatient settings (Hebrew SeniorLife outpatient geriatric practices, Brigham and Women’s Hospital Memory Disorders Clinic, Beth Israel Deaconess Medical Center senior health clinic). Participants include 35 patients and their family member health care proxies.

Outcomes: Completion of advance directives (health care proxy, living will), comfort as patient goal of care, communication between patient, family member and physician regarding goals of care and health care proxy designation, advance directive preferences (i.e. DNR, DNH) and communication with physician about preference

Independent variables: Patient (demographics, disease stage), Family member (readiness to discuss goals of care, confidence in advance care planning, knowledge of dementia, preference for timing of education regarding dementia)

Participants: The mean age of family members was 63, 60% were female, 91% white. The mean age of patients was 87, 74% were female, 97% white. 14% had mild dementia, 37% moderate dementia, 37% severe dementia and 11% had an uncategorized stage of dementia.

Results: 57% of patients had a living will and 94% had designated a health care proxy. Comfort was the goal of care for 40% of patients. 69% of patients had informed their doctor of their health care proxy choice, 74% had discussed goals of care with their proxy and 34% had discussed goals of care with their doctor. 40% expressed wish for do not resuscitate or intubate, 6% expressed wish for no hospitalization, 51% expressed wish for no tube feeding and 37% expressed wish for hospice care. The percent of patients who have discussed these wishes with their doctor was highest for resuscitation (37%), followed by hospitalization (34%), mechanical ventilation (26%), tube feeding (20%) and hospice (9%). Among family member proxies, 63% had confidence in ability to make medical decisions for the patient, 31% had enough knowledge of dementia to make medical decisions for the patient, 46% had confidence in their knowledge of the patient’s goals of care and 80% had confidence in their ability to speak
with patient’s doctor. 57% were very interested in learning more about the disease, and almost half felt that doctors should educate patients (46%) and families (49%) about the disease course at the time of diagnosis.

**Conclusions/Implications:** Advance directive completion and communication about ACP are suboptimal in this population. Family members of patients with dementia can improve their confidence in advance care planning and knowledge of dementia. Approximately half of family members wish for education regarding the course of dementia at the time of diagnosis.

**Medical Burden of Suspected Infections in Advanced Dementia**
Yates E, Mitchell SL, Habtemariam D, Dufour AB, Givens JL

**SCIENTIFIC ABSTRACT**

**Background:** Nursing home (NH) residents with advanced dementia are commonly suspected of having infections and treated with antimicrobials, often without evidence to support a bacterial infection. The use of interventions in this population has not been well-described. We sought to describe interventions used to manage suspected infections and identify factors associated with greater intervention use.

**Methods:** Residents with advanced dementia in 35 Boston NHs were prospectively followed for up to 12 months (9/09 – 11/12). Data from residents experiencing at least one suspected infection were obtained from chart reviews and healthcare proxy interviews. Interventions included: blood draw, chest radiograph, urine sample, and hospital transfer. Suspected infection sources included: respiratory tract, urinary tract, skin/soft tissue, or fever of unknown origin. The association of proxy, resident and infection variables with intervention burden was analyzed using mixed model analysis.

**Results:** 240 residents experienced 496 suspected infections. Interventions included: any, N=360 (72.6%); blood draw, N=215 (43.3%); chest radiograph, N=120 (24.2%); urine sample, N=222 (44.8%) and hospital transfer, N=51 (10.3%). In adjusted analyses, greater intervention was associated with: black race (adjusted odds ratio (AOR) 3.19, 95% confidence interval (CI), 1.37 – 7.44); lack of a do-not-hospitalize order (AOR, 1.83, 95% CI, 1.16-2.90); resident not enrolled in hospice (AOR, 5.41, 95% CI, 2.14-13.70); and suspected source being respiratory tract (AOR, 10.67, 95% CI, 4.99 – 22.80), urinary tract (AOR, 15.79, 95% CI, 7.41- 33.66) or fever of unknown source (AOR, 20.26, 95% CI, 8.42 – 48.73) compared to skin/soft tissue.

**Conclusions:** NH residents with AD frequently experience interventions for suspected infections. Advance directives to limit interventions may be appropriate for residents whose goal of care is comfort.

**Patient Activity and Survival Following Implantable Cardioverter-Defibrillator Implantation: The ALTITUDE Activity Study**
Kramer D, Mitchell SL, Monteiro J, Jones PW, Normand S, Hayes D, Reynolds M

**SCIENTIFIC ABSTRACT**

**Background:** Physical activity data are collected automatically by implantable cardioverter-defibrillators (ICDs). While these data potentially provide a quantifiable and easily-accessible measure of functional status, its relationship with survival has not been well-studied.

**Methods:** Patients enrolled in the Boston Scientific LATITUDE remote monitoring system from 2008-2012 with ICDs were eligible. Remote monitoring data were used to calculate mean daily activity at baseline (30-60 days after implantation), and longitudinally. Cox regression was used to examine the associa-
tion between survival and increments of 30 minutes/day in both (1) mean baseline activity and (2) time-varying activity; both adjusted for demographic and device characteristics.

**Results:** A total of 98,437 patients were followed for a median of 2.2 years (mean age of 67.7±13.1 years, 71.7% male). Mean baseline daily activity was 107.5±66.2 min/day. The proportion of patients surviving after 4 years was significantly higher among those in the most active versus least active quintile of mean baseline activity (90.5% versus 50.0%, log-rank P-value <0.001). Lower mean baseline activity (i.e., incremental difference of 30-minute/day) was independently associated with a higher risk of death (adjusted hazard ratio (AHR) 1.44, 95% confidence interval (CI) 1.427-1.462). Time-varying activity was similarly associated with a higher risk of death (AHR, 1.49, 95% CI 1.451 - 1.508), indicating that a patient having 30 minutes per day less activity in a given month has a 48% increased hazard for death when compared to a similar patient in the same month.

**Conclusions:** Patient activity measured by ICDs strongly correlates with survival following ICD implantation.

**Health Care Goals, Communication, and Knowledge Among Older Patients with Implantable Cardioverter-Defibrillators: The DIGNITY Pilot Study**


**SCIENTIFIC ABSTRACT**

**Background:** Initial and replacement implantable defibrillator (ICD) implantation is common in older patients. Despite the importance of defining their health care goals, little is known about the quality of their communication with providers.

**Methods:** Phone interviews of older ambulatory patients with ICDs identified as high risk for short-term mortality based on risk model incorporating comorbid conditions.

**Results.** Among 110 eligible patients, 51 participated, with mean age 71.3 years, 74.5% male, 82.4% CHF, 61.7% CAD, 44% AF, 47.9% diabetes, 24% CRT devices, 28% prior appropriate ICD therapies. Though nearly half (45%) had undergone an ICD generator replacement procedure in addition to the initial implant, only 39.2% reported that their cardiologist had ever asked them about overall goals of care, and only 9.8% reported that their cardiologist had ever discussed prognosis. Prioritization of life prolongation versus comfort varied widely (Figure), yet no health care professional discussed the possibility of ICD deactivation for most patients either at the time implant (92.2%) or since implant (82.4%). Accordingly, only a minority of patients were aware that ICDs can be turned off (47.1%), had completed a living will (35.3%), or selected a health care proxy (45.1%). Despite this, overall satisfaction with decision-making was generally high (mean Decision Satisfaction Inventory score of 72, range 0-100), and 70.6% indicated that the ICD had greatly or somewhat improved their quality of life.

**Conclusions:** Though patients report generally positive quality of life and satisfaction with decision-making, critical gaps in communication, knowledge, and advance care planning remain unaddressed in many ICD recipients.
The Center focuses on issues of quality and aging populations, establishing benchmarks for senior care around the world. In addition to generating quality reports for Hebrew SeniorLife’s communities, the Center is dedicated to increasing understanding of innovative service delivery and financing models, and identifying interventions that support the health and well-being of community dwelling seniors. This includes a partnership with Brandeis University to assess outcomes from wellness programs that focus on active lifestyle interventions, including HSL’s Vitalize 360℠.

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POWER-V360: Promoting Optimal Wellness among Elderly
Howard EP, Lipsitz LA, Schreiber R

SCIENTIFIC ABSTRACT
Background/Purpose: The purpose of this project was to determine if Vitalize 360, a comprehensive assessment system and wellness coaching program for vulnerable, low-income older adults is effective in promoting increased physical activity and personal well-being and health. The assessment system provides a thorough, holistic summary of their level of cognitive and physical functioning, disease and disability, and social engagement. Assessment results serve as an essential guide and foundation for the wellness coaching model.

Results: Using a pre-post design, 154 older adult residents of Hebrew SeniorLife housing sites completed follow-up assessments between 3 and 12 months following their enrollment in the Vitalize 360 program. At the first, post-intervention assessment, results indicate small, but not statistically significant gains in physical activity level and improved self-reported health status and quality of life. Examination of items reflecting psychological processes at the follow-up assessment revealed statistically significant decreases in self-reported feelings of anxiety or restlessness (p= .027), sadness, depression, hopelessness (p= .003), and loneliness (p= .000).

Conclusion: Given the national mandate for supporting older adults to maintain optimal health and well being, there is preliminary evidence that Vitalize 360 is an effective strategy to produce emotional outcomes that support successful aging for a growing population of vulnerable, low-income older adults.

AgeWell: Use of a Peer to Peer Model to Support Healthy Aging
Cape Town, South Africa
Geffen LN, Morris JN, Howard EP

SCIENTIFIC ABSTRACT
Background/Purpose: The purpose of this project was to conduct a comprehensive assessment of community-dwelling older adults and for a subset of the assessed participants, implement a peer to peer model to support healthy aging. Trained assessors met in prospective participants’ homes to conduct the assessment. Eligibility for this program was based on results from the interRAI Check-up Assessment, targeted those individuals most likely to benefit from the intervention and excluded the very frail and extremely healthy individuals. AgeWell employed older persons, age >60 years, as visitors, providing peer to peer companionship for a group of older adults residing in Khayelitsha, a peri-urban suburb of Cape Town. Based on assessment
results, AgeWell visitors conducted home visits weekly, bi-weekly, or monthly and made daily or weekly phone calls. The AgeWell visitors were trained to identify potential health issues early, allowing for out-patient evaluation and management by health care providers and supporting the independence, health and well-being of the older adults.

**Results:** Older adult participants had 5 months of exposure to the program. Comparison of outcome measures from baseline and follow-up/end of program assessments revealed statistically significant improvements in the areas of mood, social engagement and physical activity. At baseline, 18% of elders reported feeling sad, depressed or hopeless daily in the previous 3 days, this decreased to 0.7% at follow up. 41.3% were judged to have sad, pained or worried facial expressions in the prior 3 days at baseline which dropped significantly to 7% at follow up. 77% reported being lonely at baseline, and 61% at follow up. At baseline approximately 40.6% of the participants reported reduction in social interactions improving to 3.5% \( p = .000 \) 5 months later. Prior to program implementation, nearly half of the participants reported engaging in no physical activity in the past 3 days. After 5 months, this number decreased to 33.6% with 27.2% and 5.6% reporting 1-2 hours and 3-4 hours of physical activity in the past 3 days.

**Conclusion:** The AgeWell peer to peer model was effective in supporting healthy aging for older adults in Cape Town. With a 5 month implementation plan, statistically significant results were achieved in the areas of mood, social engagement and physical activity. This project provides preliminary evidence that a peer to peer model may be effective in supporting the independence, health and well-being of poor, older adults.

**Using the Community Health Assessment to Screen for Continued Driving**  
**Morris JN, Howard EP, Fries BP, Berkowitz R, Goldman B, David D**

**SCIENTIFIC ABSTRACT**

**Background/Purpose:** The purpose of this project was to develop a model for identifying current elder drivers whose driving behavior should be reviewed using the interRAI based, Community Health Assessment (CHA).

**Results:** Secondary analysis of data drawn from older adults in COLLAGE sites in the United States was conducted using a baseline assessment of 8,042 subjects and an annual follow-up assessment with 3,840 subjects. A Driving Review Index (DRI) was developed based on 13 items identified by a logistic regression analysis to predict drivers whose driving behavior was questioned by others. In particular, three variables reference compromised decision-making abilities: general daily decisions, a recent decline in ability to make daily decisions, and ability to manage medications. Two additional measures assess cognitive status: short-term memory problem and a diagnosis of non-Alzheimer's dementia. Functional measures reflect restrictions and general frailty, including receiving help in transportation, use of a locomotion appliance, having an unsteady gait, fatigue, and not going out on most days. The final three clinical measures reflect compromised vision, little interest or pleasure in things normally enjoyed, and diarrhea.

**Conclusion:** There is a need for simple and quick screening tools to identify those older adults whose driving should be reviewed. The DRI, based on the interRAI CHA, fills this void. Assessment at the individual level needs to be part of the backdrop of science as society seeks to target policy to identify high risk drivers instead of simply age-based testing.
Biostatistics involves the capture and interpretation of quantitative data in the biomedical sciences. It is integral to the advancement of knowledge in biology, health policy, clinical medicine, public health, health economics, proteomics, genomics, and other disciplines.

At IFAR, biostatisticians engage in a large number of collaborative interactions with HSL investigators, as well as clinical and quantitative scientists both nationally and internationally. These projects include clinical trials and epidemiologic investigations in physical functioning, nutrition, musculoskeletal health, cognitive function and the endocrinology of aging, among others. Our work therefore supports and is integral to IFAR’s uniquely holistic approach to aging research.

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Development of Age-specific Reference Ranges for SexSteroids Using Data from Multinational Cohorts

Travison TG, PATH Testosterone Reference Ranges Group

SCIENTIFIC ABSTRACT

Background: Precise measurement of circulating hormone levels is important for research and clinical practice. Variation in the measurement technologies used in population-based studies hinders comparisons across populations. Using data from five population-based cohort studies and a centralized measurement laboratory, we developed equations describing correspondence between study-specific measurements and a centralized research standard.

Results: Analyses indicated that linear transformations of hormone measurements were sufficient to adjust each study’s measurements to a centralized research standard. From centralized measurements, revised reference ranges for each relevant background population were obtained.

Conclusions: It is feasible to standardize steroid hormone measurements obtained using varying technologies, facilitating cross-cohort comparisons of typical concentrations and reference ranges.
Development of an Integrated Data Analytic and Reporting Workflow for Reproducible Research
Zhu H, Isaza Aizpurua II, Tsai T, Travison TG

SCIENTIFIC ABSTRACT
Background: Reproducibility is a central cornerstone of the validity of scientific research. The many steps between acquisition of data and reporting of analytic results, however, render the process of reporting data error-prone, and endanger the reproducibility and validity of results. Here we report the development of a workflow for the reporting of research results using free and platform-independent data analysis and typesetting tools, permitting the generation of publication-quality results without resort to error-prone techniques such as “copy and paste.”

Results: Building on existing work and literature, we developed a series of macros and templates for use in the reporting of clinical research studies, and demonstrated their utility and functionality on Unix and Windows based computing environments.

Conclusions: Routine use of reproducible research workflow is feasible in the context of the demands of clinical and population-based research, provided nontrivial investment of resources to develop and test procedures permitting valid and efficient conduct of analyses and report generation.
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