

# CSM 2019 Platform Abstracts

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**TITLE:** Assessing Falls Risk in Older Adults Through Tests of Mediolateral Stability During Gait

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Ben Sidaway, Joseph Bennett, Robert Dimonte, Kerianne Marie Downing, Shelby E. McGibney, Sarah Michelle Pare, Jeffrey Rome

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Declines in the postural control system lead to an increased risk of falls in older adults, many of which are attributed to a loss of mediolateral stability during gait. Numerous tools have been developed in an attempt to assess the falls risk but most of these do not specifically test gait stability and only one, the Narrow Path Walking Test (NPWT), is specifically designed to assess dynamic mediolateral stability during gait. The current experiment examines whether a simple, cost effective beam-walking task might be able to assess falls risk in older adults by taxing mediolateral stability during gait and compares this new tool to the NPWT.

**Number of Subjects:** 50 community dwelling older adults (65 – 96 years old) and 20 younger adults (20-35 years old).

**Materials and Methods:** After collecting falls history participants completed the Activities-specific Balance Confidence (ABC) scale and the Dynamic Gait Index (DGI). Then participants walked three times along a 6 m long computerized gait mat in an unrestricted manner. The gait mat was used to record the following variables: gait velocity, cadence, step length, step length variability, step time, and step timing variability. The NPWT was also performed on the gait mat. This test requires participants to walk along a path that is 50% of the pelvic width plus one shoe width wide. The number of errors in keeping within the path were recorded. Participants also attempted to walk 3 times along a series of three 2 cm thick wooden beams 6 m in length. Beam widths were 6, 9, and 12 cm in width. Only the widest beam allowed the whole width of participants' shoes to be supported. Distance walked, number of steps, and gait velocity were recorded for beam walking. Six months following completion of testing, fall history was again taken.

**Results:** Older adult fallers and non-fallers were differentiated based on their walking performance on the 9 cm beam. Non-fallers had a significantly faster velocity (0.36 m/s) and walked a longer distance (1.93 m) compared to fallers (0.17 m/s and 0.69 m respectively). Fallers scored lower on both the ABC (60.53%) and DGI (17.53/24) when compared to non-fallers (79.58% and 20.06/24 respectively). The coefficient of variation for step time and step length for normal walking was significantly different between fallers and non-fallers. Fallers made more errors on the NPWT. Statistically significant non-parametric negative correlations were found between falls in the previous 6 months and velocity, number of steps, and distance walked on the 9 cm beam. A positive correlation was found between falls and step length variability on the gait mat. Performance on the 9 cm beam was also predictive of future falls risk.

**Conclusions:** Falls risk in older adults could be differentiated using the NPWT and the consistency of gait parameters derived from the computerized gait mat. Walking performance on the 9 cm beam was also capable of differentiating fallers from non-fallers without the complexity of the gait mat or the NPWT.

**Clinical Relevance:** The use of a simple and cost effective beam walking task may be a clinically valuable outcome tool to assess fall risk in older adults due to loss of mediolateral stability.

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## CSM 2019 Platform Abstracts

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**TITLE:** Multimodal Swelling Management After Total Knee Arthroplasty: A Pilot Study With Cohort Comparison

**CURRENT SECTION:** Geriatrics

**AUTHOR:** Joel Carmichael

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Swelling after total knee arthroplasty (TKA) is a major patient complaint and is associated with decreased muscle activation, strength, range of motion, and functional performance as well as increased pain and post-surgical complications such as deep venous thrombosis. However, current physical therapy interventions such as cryotherapy are largely ineffective in reducing swelling and its associated sequelae. The purpose of this pilot study was to determine the feasibility and initial efficacy of a multimodal swelling management (MSM) program for swelling after TKA.

**Number of Subjects:** 11

**Materials and Methods:** This was a prospective pilot study with historical cohort comparison. Eleven participants awaiting TKA for end-stage osteoarthritis (age  $67 \pm 6.4$  years (mean  $\pm$  SD); 7 female) were consecutively enrolled and participated in MSM for 3 weeks after TKA. Patients were excluded if: 1) body mass index  $> 40 \text{ kg/m}^2$  or 2) had a history of heart failure, lymphatic insufficiency, or any other condition associated with chronic lower extremity swelling. The MSM program consisted of use of a medical grade compression garment (Circaid<sup>®</sup> Juxtafit<sup>®</sup> Essentials) for 12 hours daily, self-administered manual lymph drainage massage once daily, and lower extremity active range of motion exercises performed 5 times daily to encourage venous and lymphatic return. Primary outcomes were patient satisfaction, adherence, and bioelectrical impedance, a valid and reliable measurement of swelling. All primary outcomes were assessed preoperatively and at 1, 2, 3, and 6 weeks postoperatively. Secondary outcomes included quadriceps strength and activation at 6 weeks. Data were compared to an historical control group ( $n = 56$ ) with identical inclusion and exclusion criteria (CONTROL). Preliminary effect sizes were obtained by calculating Cohen's d statistic.

**Results:** 100% of MSM participants were satisfied with the intervention. Adherence for the compression garment, manual lymph drainage massage and exercises was 82%, 100%, and 100% respectively. MSM showed a large reduction in swelling compared to CONTROL at 1, 2, and 6 weeks with effect sizes of  $-1.41$ ,  $-1.30$  and  $-0.83$  respectively. Using published CONTROL swelling estimates (50<sup>th</sup> percentile), MSM demonstrated 59.5% less swelling than CONTROL at 3 weeks. At 6 weeks MSM attenuated postoperative quadriceps strength loss to a greater degree compared to CONTROL (effect size of 0.49). MSM also led to an increase in quadriceps activation compared to CONTROL (effect size 0.46).

**Conclusions:** Use of the MSM program was feasible for treating swelling after TKA and led to large improvements in post-operative swelling and moderate improvements in quadriceps strength and activation. Larger randomized controlled trials are needed to determine the efficacy of the MSM program.

**Clinical Relevance:** The MSM program is the first conservative intervention to demonstrate initial success in controlling postoperative swelling after TKA.

## CSM 2019 Platform Abstracts

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**TITLE:** Determining AM-PAC “6-Clicks” Scores to Predict Discharge Following Elective Joint Replacement in the Geriatric Population

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Dana Rose Maida, Barbara Reddien Wagner, Heidi Bockelkamp

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The changing healthcare environment has decreased hospital stay for patients undergoing total joint replacement (TJR), and circumstances unique to older adults often impact their ability to directly return home. Research previously presented by these authors identified statistically significant correlations among age, discharge (D/C) destination, and scores using the Boston University Activity Measure for Post-Acute Care “6-Clicks” Inpatient Short Forms (6-Clicks), and determined the physical therapy (PT) 6-Clicks cutoff score at initial evaluation (IE) as 13.5/24 for both persons under and over the age of 65 years. The purpose of this study was to specifically analyze the geriatric population to determine if different PT 6-Clicks cutoff scores should be used to predict discharge to home for persons of advancing ages following elective TJR.

**Number of Subjects:** 494

**Materials and Methods:** Researchers retrospectively reviewed 494 charts of persons age 65 and older who underwent elective total hip, knee, and shoulder replacements at a local hospital June 2013-February 2015. Data collected included age, PT IE 6-Clicks scores, and D/C destination. The data was entered into Statistical Package for Social Sciences (SPSS) and analyzed using Crosstabs (age, D/C destination, and 6-Clicks), ROC Curve analysis, and MEDCALC diagnostic test evaluation.

**Results:** Subjects ranged from 65-91 years (y/o), ( $\bar{x} = 73.07 \pm 5.834$ ), with the following breakdown by age: 65+ = 494, 70+ = 321, 75+ = 185, 80+ = 76, 85+ = 18. ROC curve analysis and MEDCALC tests revealed cutoff scores providing the best accuracy for determining D/C destination to home to be: 65+ 13.5/24 [Sensitivity (Sen) 67.28%, Specificity (Spe) 64.72%, Positive Predictive Value (PPV) 48.66%, Negative Predictive Value (NPV) 79.92%]; 70+ 12.5/24 [Sen 82.35%, Spe 50.00%, PPV 37.43%, NPV 88.64%]; 75+ 14.5/24 [Sen 55.17%, Spe 78.57%, PPV 32.65%, NPV 90.30%]; 80+ 15.5/24 [Sen 50.00%, Spe 85.29%, PPV 28.57%, NPV 93.55%]. Area under the curve (AUC): 65+ = .715; 70+ = .700; 75+ = .709; 80+ = .722, all indicating fair discrimination. Cutoff scores and AUC values could not be determined for subjects 85+ secondary to all were discharged to a rehab setting.

**Conclusions:** In conclusion, based on the findings of this study, higher 6-Clicks cutoff scores are recommended for determining discharge for persons 75+ (>14.5/24) following elective TJR. These findings remain lower than previously published cutoff scores of 17/24, which may relate to electiveness of the surgery. Future research should investigate scores for the geriatric persons in the general acute care setting, as well as hospital readmissions to help determine if discharge to home was the appropriate recommendation.

**Clinical Relevance:** As more outcome measures are being used to assist with discharge planning, it is important to consider the impact of the person’s age, specifically in the geriatric population. Clinicians should be aware that older persons may require a higher cutoff score to recommend discharge to home. Social factors, comorbidities, and prior level of function should also be considered, given the unique needs of the geriatric population.

## CSM 2019 Platform Abstracts

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**TITLE:** Hip-Spine Syndrome: A Risk Factor for Multiple Falls?

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Patrick James Knox, Peter C. Coyle, Jenifer M Pugliese, Jaclyn Megan Sions, Gregory Evan Hicks

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Older adults with low back pain (LBP) are at increased risk of any fall and recurrent falls compared to healthy peers. Given hip impairments are more prevalent in older adults with chronic low back pain (CLBP), and hip-spine syndrome predisposes older adults to reductions in physical performance and health-related quality of life, it is imperative to assess whether or not coexisting hip impairments increase fall risk in older adults with CLBP. Therefore, the objective of the study was to determine if hip osteoarthritis (OA) signs and symptoms per American College of Rheumatology (ACR) criteria were predictive of multiple falls during a 12-month time period.

**Number of Subjects:** Two-hundred and fifty community-dwelling older adults (i.e. 60-85 years) with CLBP participated in a prospective, observational cohort study. CLBP status was characterized by intensity ( $>3/10$ ), frequency ( $\geq 4/7$  days/week), and impact on daily function. Participants were excluded if they had the following: lower extremity pain  $\geq$  LBP, acute or inflammatory spinal conditions, or a history of spinal surgery.

**Materials and Methods:** Falls were prospectively monitored for one year via monthly fall calendars. The following falls outcome categories were coded according to aggregate sums: multiple fallers versus non- and single-fallers (i.e.  $\geq 2$  vs.  $\leq 1$ ). Age, sex, race, prior fall history, and medication usage were identified a priori as covariates and collected at baseline. Between-group differences were used to determine remaining potential covariates, yielding the Activities Specific Balance Confidence Scale (ABC-16) and Quebec Back Pain Disability Scale (QBPDS). Both hips were evaluated at baseline for the presence of ACR criteria: hip pain, pain with internal rotation, internal rotation  $\geq 15$ deg, and morning stiffness lasting  $\leq 60$  minutes. The number of criteria present for both lower extremities were totaled to calculate a hip-related impairment burden measure. Binomial logistic regression assessed the ability of hip osteoarthritis signs and symptoms to predict odds of falling multiple times beyond established covariates.

**Results:** Complete data was available for 211 participants, of which 51 fell multiple times, 39 fell one time and 121 did not fall at all. Higher ACR criteria burden was associated with significantly increased odds of multiple falls (OR=1.481, 95% CI 1.134-1.933,  $p<0.05$ ). This association remained significant after adjustment for demographics, anthropometrics, anxiolytic usage, balance confidence, LBP-related disability, and prior fall history (OR=1.394, 95% CI 1.005-1.935,  $p<0.05$ ).

**Conclusions:** For each additional hip-related impairment among older adults with CLBP, there is a 40% increase in the odds of falling multiple times, even when known and suspected covariates are taken into account.

**Clinical Relevance:** Hip-spine syndrome augments fall risk beyond that associated with LBP alone. Clinicians should routinely incorporate assessment of ACR criteria in the falls screening process during evaluations of older CLBP patients.

## CSM 2019 Platform Abstracts

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**TITLE:** Physiotherapy Rehabilitation for Osteoporotic Vertebral Fracture - Randomised Controlled Trial and Economic Evaluation (PROVE Trial)

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Karen Barker, Kathy Marlane Shipp

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Vertebral fragility fractures are associated with significant pain and reduction in quality of life. Physical therapy is often recommended for patients and typically includes manual or exercise therapy [1]. There is little evidence to support either approach. We investigated the clinical and cost-effectiveness of two different physical therapy programs for people with symptomatic osteoporotic vertebral fractures compared with a single session of physical therapy.

**Number of Subjects:** 615 participants with a diagnosis of osteoporosis and at least one painful vertebral fracture.

**Materials and Methods:** Prospective, multi-center, assessor blinded, three-arm randomized trial of 7 sessions of manual therapy vs. exercise therapy delivered over 12 weeks compared to a single one hour session with a specialist physiotherapist [2]. The co-primary outcomes were quality of life (QUALLEFO 41) and muscle endurance (Timed Loaded Standing (TLS) test) at one year [3]. Secondary out-comes were: thoracic kyphosis measured with a Flexicurve ruler, balance evaluated via the Functional Reach (FR) test and physical function by the Short Performance Physical Battery (SPPB), 6 minute walk test and Physical Activity Scale for the Elderly (PACE), a health resource use diary and the EQ-5D-5L at 4 and 12 months.

**Results:** 615 patients were enrolled with 216 patients randomised to the exercise therapy arm, 203 patients to manual therapy arm and 197 to usual care arm. The mean age was 72 .1 years and 87% were female.

No statistically significant differences occurred between the groups. Mean QUALEFFO-41: -1.3 (exercise), -0.15 (manual) and -1.2 (SSPT), a mean difference of -0.2 (95% CI, -3.2 to 1.6) for exercise and 1.3 (95% CI, -1.8 to 2.9) for manual therapy. Mean TLS: 9.8s (exercise), 13.6s (manual) and 4.2s (SSPT), a mean increase of 5.8s (95% CI, -4.8 to 20.5) for exercise and 9.7s (95% CI, 0.1 to 24.9) for manual therapy. Exercise therapy resulted in more quality adjusted life years (QALYs) than SSPT but was more expensive.

At 4 months balance improved significantly in both intervention arms above SSPT. At 4 months significant changes above SSPT also occurred in endurance in manual therapy, and in endurance for those  $\leq 70$  years, in balance, mobility and walking capacity in exercise therapy. The subgroup analysis highlighted improvements in endurance were experienced primarily by those 70 years or younger. Younger participants may have had more capacity to improve and/or found home exercise and treatment attendance easier.

**Conclusions:** In the largest trial assessing physiotherapy in patients with osteoporotic fragility fractures, benefits at 4 months did not persist and at 12 months we found no significant differences between the three treatments. As in other studies [4,5] adherence was problematic and most participants did not receive the planned intervention intensity. Furthermore, our comparator was education by a physiotherapist and 25% (50/196) participants in SSPT sourced additional physiotherapy outside of the trial. These differences exposed the trial to the risk that intervention effects were lost or underestimated. Future research should focus on improving adherence to therapy recommendations.

**Clinical Relevance:** There is inadequate evidence to support manual or exercise therapy for long-term benefit, but arguably short-term benefits are valuable and a single education session with a physiotherapist confers benefit.

## CSM 2019 Platform Abstracts

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**TITLE:** Examining Validity and Responsiveness of the Sitting Balance Scale Across Settings and Patient Diagnoses

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Mary C. Thompson, Ann Medley, Debra Rone McDowell

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The Sitting Balance Scale (SBS) is a functional sitting balance test that was designed for frail older adults. The scale has limited, but promising evidence for its psychometric properties and requires less than 10 minutes to administer, analyze, and interpret. Using a prospective cross-sectional methodological design, the purpose was to investigate the psychometric properties of the SBS measured at admission and discharge of patients receiving physical therapy in acute care and post-acute settings.

**Number of Subjects:** A convenience sample of 119 patients (mean age = 73.8 years) with any diagnosis who were non-ambulatory or had difficulty walking with or without an assistive device at admission. Patients received physical therapy in the following settings: 1 acute care hospital, 5 inpatient rehabilitation units, 7 skilled nursing facilities (SNF), and 6 outpatient clinics.

**Materials and Methods:** As part of the initial physical therapy examination, testers screened participants for eligibility and if qualified, participants provided informed consent. Participants received an appropriate physical therapy initial examination for their diagnosis with the addition of the Timed Up and Go (TUG) if ambulatory, and 2 study-specific outcome measures: Berg Balance Scale (BBS) and SBS. The rehabilitation team then designed a patient-specific plan of care. At discharge, all initial tests and measures were repeated. Data collected from medical records included demographics, primary diagnosis and any co-morbidities, and fall history in the past year.

**Results:** Performance on all measures improved from admission to discharge ( $P < .001$ ). At admission and discharge, SBS demonstrated good concurrent validity with BBS (Spearman  $\rho = .862$  and  $.703$ ). SBS demonstrated known group validity at admission, discharge, and with change scores. At admission and discharge, hospitalized patients had lowest SBS scores and those in outpatient the highest ( $P < .001$ ). In post-hoc testing, patients in SNFs had lower SBS scores compared to inpatient rehabilitation and outpatient clinics. SBS change scores discriminated between settings ( $P < .001$ ) with patients in hospital having the highest change scores and outpatients the lowest. None of the outcome measures accurately predicted history of standing falls (AUC for TUG, SBS, and BBS all  $< .5$ ). However, SBS accurately predicted assistive device need (AUC =  $.839$ ,  $P < .001$ ). Any participant scoring lower than 40 on the SBS likely needs an assistive device for mobility.

**Conclusions:** Across a variety of settings, the SBS appears to be a valid clinical tool for assessing functional sitting balance in patients with any diagnosis who have difficulty walking.

**Clinical Relevance:** Results may guide clinician decisions regarding functional assessments and assistive device need. Additional study is required due to the relatively small sample size in the acute care setting.

## CSM 2019 Platform Abstracts

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**TITLE:** Effect of Upper Extremity Restraint on Gait Temporospacial Parameters and Trunk Motion in Older Adults

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Deborah L. Doerfler, Yuri Yoshida, Burke Gurney, PT, PhD, OCS

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The contribution of upper extremities (UE) to trunk movement and ambulatory function is well established. Age-associated changes in gait kinematics are linked to falls. Gait-kinematic variability may increase when arm movement is restrained in older adults. The purpose of this preliminary investigation was to objectively quantify the effect of UE restraint on gait kinematics while ambulating under different restraint conditions in healthy older adults. We hypothesized that there would be a difference in gait kinematic variables between arm restraint and non-restraint conditions.

**Number of Subjects:** Fifteen

**Materials and Methods:** Gait parameters during self-selected gait speed were quantified with a 3D motion analysis system in fifteen healthy older adults under 5 conditions: 1) no UE restraint, 2) standard post-operative shoulder sling (SL), 3) long arm bivalve cast, 4) dorsal blocking splint, and 5) Givmohr sling. Repeated measures ANOVA with an alpha level of .05 was used to determine differences in temporal-spatial parameters and trunk movements among the conditions.

**Results:** There was a significant difference in step width within brace conditions, with significantly greater step width in SL compared to other conditions ( $\Delta$  0.5-1.0 cm,  $p < .05$ ). There was no brace\*limb interaction for stance phase, but there was a significant main effect of limb, with significantly longer stance phase for the braced side ( $\Delta$  1.2%,  $p = 0.02$ ). There was a significant difference in trunk lateral flexion, showing less trunk lateral flexion in SL compared to other conditions ( $\Delta$  1.7-1.8°,  $p < .05$ ). There was a significant difference in trunk rotation, showing less trunk rotation in SL compared to other braced conditions ( $\Delta$  3.7-4.1°,  $p < .05$ ).

**Conclusions:** UE restraint could alter dynamic balance ability during ambulation, yet the detailed mechanisms have not been clearly elucidated. Preliminary data suggest that UE restraint creates asymmetrical stance phase but only the SL condition affects step width and trunk motion during level terrain ambulation. This investigation is ongoing to further elucidate the effect of UE restraint on gait variability.

**Clinical Relevance:** Limited UE motion is a common impairment in the older adult and limiting UE motion is often prescribed to protect healing tissues after an upper extremity injury or procedure. However, UE motion restrictions may affect balance reactions during ambulation and persist long after the period of restricted motion. Restraining the UE more proximally (i.e. shoulder) may reduce trunk motion but increase step width as a compensatory strategy. This investigation provides clinical insight of the effect of UE restraint on gait variability that may contribute to fall risk.

## CSM 2019 Platform Abstracts

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**TITLE:** Sensorimotor Cortical Mechanisms During Reactive Balance in Older Adults

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Jacqueline Ann Palmer, Aiden M. Payne, PhD, Nina Ghosn, Michael Robert Borich, Lena H. Ting, PhD

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The emergence of balance impairments with aging are common but poorly understood. The cerebral cortex plays an important role in the integration of sensorimotor information for balance recovery after a postural perturbation.<sup>1,2</sup> Under cognitive demand, older adults (OAs) show greater balance impairment than young adults (YAs), suggesting that OAs rely more on the cortex for postural stability.<sup>3,4</sup> However, few studies have directly investigated cortical responses during balance recovery in OAs. During a volitional motor task, OAs have greater cortical activity than YAs,<sup>5,6</sup> possibly due to reduced intracortical inhibition between cortical regions.<sup>7,8</sup> We hypothesized that OAs would have 1) greater increase in cortical activity and 2) stronger sensorimotor cortical connectivity during balance recovery compared to YAs. We further tested whether metrics of cortical activity and connectivity were associated with balance ability in OAs and YAs.

**Number of Subjects:** OAs (n=11; 73±6 yr); YAs (n=14; 25±5 yr).

**Materials and Methods:** High-density electroencephalography (EEG) recordings of cortical activity were collected while participants stood on a platform during support-surface translations of low, medium, and high magnitudes. Cortical activity was calculated as the peak increase in power within the beta frequency range (13-30 Hz) in the electrode overlying the lower limb primary motor cortex (Cz) during balance recovery (0-400 ms post-translation initiation). Sensorimotor cortical connectivity was quantified as the mean beta frequency coherence value between electrodes overlying lower limb somatosensory (CPz) and primary motor (CZ) cortices<sup>9</sup> during balance recovery. We tested the relationship between sensorimotor cortical power and coherence versus the reactive postural control score of the mini-BESTest in OAs and the distance walked across a narrow beam in YAs.<sup>10</sup>

**Results:** Following balance perturbation, beta power increased in both OAs and YAs ( $p<0.01$ ), with OAs showing the *greatest* beta power increase in response to high magnitude perturbations ( $p=0.01$ ). No differences were found across perturbation magnitudes in YAs. There was no increase in beta coherence during balance recovery in either group. There was a positive relationship between post-perturbation beta coherence and clinical balance function only in OAs ( $r=0.80$ ,  $p<0.01$ ).

**Conclusions:** In contrast to YAs, OAs show increased recruitment of sensorimotor cortex as balance challenge is raised. The relationship between sensorimotor cortical coherence and balance function suggests that increased inhibitory neural connectivity between somatosensory and motor cortices during balance recovery may be used to compensate for reduced subcortical automatic balance function with aging.

**Clinical Relevance:** Rehabilitation strategies that effectively target sensorimotor cortical connectivity could potentially improve balance function and reduce fall risk in older adult populations. Further, rehabilitation strategies for improving balance function may need to target different neural substrates in older and younger adults.

## CSM 2019 Platform Abstracts

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**TITLE:** Age-Related Decline of Curved Path Walking: Evidence for the Loss of Adaptability

**CURRENT SECTION:** Geriatrics

**AUTHOR:** Taylor Woods

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Curved path walking is embedded in home and community navigation and requires adaptability in the form of greater variability in step length and width to manage the curve amidst a straight path. Such adaptability is unique to curved paths and not a part of straight path (usual) walking,<sup>1</sup> the major focus of aging clinical gait research and interventions to improve walking and reduce falls.<sup>2,3</sup> Curved path walking affords the potential for earlier recognition and earlier 'in-the-course-of-walking-skill-decline' interventions. We examined age-related differences in motor control (stepping variability) during curved path walking and hypothesized that, compared to young adults, older adults would exhibit different patterns of spatiotemporal variability.

**Number of Subjects:** 56

**Materials and Methods:** Young adults (YA, n=22; mean age 23.05±2.2) and healthy older adults (OA, n=34; mean age 70.85±9.2) performed the Figure-of-8 Walk test (F8W),<sup>4</sup> a figure of 8 walk pattern about two cones, 5 feet apart, over an instrumented walkway. Variables derived were means and standard deviations (variability, V) in *cm* for step length (SL, SLV), step time (ST, STV) and stride width (SW, SWV); time and number of steps to complete the F8W were recorded. Univariate analyses were used to determine the impact of age/F8W ability (YA; OA with good F8W time <8.0s, n=16; OA with slow F8W time >8.0s, n=18)<sup>5</sup> on curved path walking using variability (SLV, STV, SWV) as the dependent variable, group as the independent variable, while controlling for mean variables (SL, ST, SW). Principal component factor analysis (PCA) was used to examine mechanisms underlying curved path walking based on the loading pattern of variables on factors contributing to the total variance explained.

**Results:** During curved path walking, age/F8W ability explained variance in SLV (F=3.578, df, 2,52;p=0.035) and SWV (F=9.779, df, 2,52; p=<.001) but not STV (F=1.082, df, 2,52; p=0.35). Pairwise comparisons revealed OA with good F8W time had similar SWV but higher SLV (21.95 ± 4.56 vs 18.21 ± 3.92) compared to YA, and higher SLV alone compared to OA with slow F8W time (18.73 ± 4.97). In contrast, OA with slow F8W time had significantly lower SWV (18.80 ± 5.05) compared to both OA with good F8W time (23.10 ± 3.39) and YA (25.27 ± 4.96). PCA revealed four factors explaining 40%, 18%, 18%, and 13% of the variance; total variance explained 89%. Factor 1 was represented by F8W time and steps, mean SL, and SWV; factor 2 by SLV and STV; factor 3 by mean ST and F8W time and factor 4 by mean SW.

**Conclusions:** Age-related differences in adaptation during curved path walking were observed. Loss of step width variability characterized OAs who had difficulty with curved path walking. We interpreted the PCA factors to represent: 1) adaptability/mediolateral control, 2) rhythm 3) timing/pace, and 4) maintenance of base of support.

**Clinical Relevance:** These data indicate that training adaptability and walking skill should include task-specific practice of curved paths and active adjustments of stride width while maintaining rhythm/pace.

## CSM 2019 Platform Abstracts

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**TITLE:** Balance and Functional Impact of Exercise in Residential Care-Dwelling Older Adults With Mild Balance Dysfunction

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Alicia Fernandez-Fernandez, Varatharajan Lingam, Leah Nof, Olaide Oluwole-Sangoseni

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The purpose of this study was to investigate the effect of an individualized versus a generic group-based exercise program on balance, gait, and functional performance of older adults with mild balance dysfunction and living in residential care facilities.

**Number of Subjects:** One hundred-twenty subjects living in residential care facilities.

**Materials and Methods:** Single blind randomized control design. Subjects were screened for mild balance dysfunction with the BioSway™ portable balance system and Multi-Directional Reach Test (MDRT). Secondary outcome measures included the Modified Physical Performance Test (PPT), lower extremity strength, and gait speed. For 8 weeks, subjects in the individualized group (n=60) received customized physical therapy intervention, whereas group-based subjects (n=60) received a fall prevention booklet, activity log, and participated in facility exercise programs. All outcome measures were collected at baseline and after 9 weeks; and BioSway™ and PPT measures were also collected after 13 weeks for the individualized group.

**Results:** After 9 weeks, the individualized group showed significant improvement compared to group-based on two BioSway™ scores (limits of stability,  $p < .001$ ; postural stability,  $p = .016$ ), MDRT scores (forward reach,  $p < .001$ ; backward reach,  $p = .007$ ; right lateral reach,  $p < .001$ ; left lateral reach  $p < .001$ ), lower-limb muscle strength scores (hip flexors,  $p = .010$ ; knee extensors,  $p = .002$ ; hip abductors,  $p = .009$ ; ankle dorsiflexors,  $p = .025$ ), PPT outcomes ( $p < .001$ ), and 6-meter comfortable walk test scores ( $p = .012$ ). Effect sizes ranged from small to large. In the BioSway™ modified clinical test of sensory integration of balance (CTSIB), 96.7% of the individualized group subjects scored within one standard deviation of the normative mean, versus 75% for group-based. Only the individualized group demonstrated progression in ambulation and frailty classifications. After 13 weeks, the individualized group showed significant differences from baseline with medium to large effect sizes on the PPT ( $p < .001$ ), limits of stability ( $p < .001$ ), postural stability ( $p < .001$ ), and CTSIB ( $p = .005$ ). Post-hoc analysis revealed retention of gains for all measures except CTSIB.

**Conclusions:** Older adults with mild balance dysfunction and living in residential care facilities benefited more from an individualized structured program led by a physical therapist, compared to a generic group-based program. The individualized exercise group showed significantly larger improvements in the areas of balance, strength, mobility, and functional outcomes.

**Clinical Relevance:** This study provides additional evidence on potentially effective clinical approaches for the management of mild balance dysfunction in older adults. An individualized approach to treatment is clearly superior to group-based generic approaches, highlighting the importance of skilled physical therapy, early detection, and a customized plan of care in addressing mild balance dysfunction in this population.

# CSM 2019 Platform Abstracts

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**TITLE:** A Train-the-Trainer Approach to Increasing Physical Activity for Persons With Dementia Across Care Settings

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Ellen L McGough, Rachel A Prusynski, Bernadette Williams York, Louise Goldman

**ABSTRACT BODY:**

**Theory/Body:** Persons with dementia (PWD) are at high risk for mobility disability and poor health due to limited physical activity (PA). Interventions that combine exercise and behavioral management techniques are effective in improving PA and functional mobility in PWD. In addition to cognitive impairment, barriers to increasing and sustaining PA in PWD include comorbidities, limited access to therapy services, and reduced social support. To address these barriers, across care settings, care staff involvement is needed. Physical therapists (PTs) can play a vital role in promoting PA for PWD by implementing strategies that support task shifting to other care team members. Direct care staff can be effectively trained to provide exercise and behavioral interventions that increase PA and improve function in PWD.

This project, funded by the NIH National Institute of Aging (5P30AG034592-07), developed and implemented a train-the-trainer program to deliver EM-STAR (Exercise for Mobility & Staff Training in Assisted Living Residences) within adult day health and residential programs. EM is a dementia-specific moderate intensity program of familiar procedural movements designed to be led by non-rehab direct care staff. STAR is a curriculum designed to help staff improve care of PWD via behavioral management strategies.

A two-tiered program was developed. Phase 1 prepares rehab professionals as EM-STAR trainers and site coordinators. Phase 1 rehab professional objectives: (1) demonstrate knowledge about importance of exercise to reduce mobility disability in PWD, (2) demonstrate self-efficacy around training care staff in exercise and behavioral strategies, (3) demonstrate proficiency in the role of site coordinator, including staff training, participant enrollment, monitoring safety, and ensuring program fidelity. Phase 2 prepares care staff to become exercise leaders. Phase 2 care staff objectives: (1) demonstrate knowledge about importance of exercise to reduce mobility disability in PWD, (2) demonstrate self-efficacy around leading exercise classes and managing challenging behaviors, (3) demonstrate competency in day-to-day management of the program and leading group exercises.

To facilitate program development, focus groups were conducted with rehab professionals and care staff. Resulting program materials include an EM-STAR handbook for trainers and exercise leaders, protocol cards for EM exercises, timed music to coincide with the exercises, and a video of the EM routine to ensure training fidelity. Rehab professionals are certified as site coordinators after they demonstrate proficiency in training and certifying care staff as exercise leaders. Observational performance audits with a program checklist are implemented to certify the care staff as exercise leaders. The EM-STAR program demonstrates an evidence informed program that aims to increase PA in PWD. PTs can play a vital role in the scaling up of PA, across care settings, through programs that involve train-the-trainer strategies designed to prepare direct care staff to lead and sustain moderate intensity exercise programs with a high degree of safety and fidelity.

## CSM 2019 Platform Abstracts

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**TITLE:** Development of Patient-Centered Cut-Points for the Figure-of-8-Walk Test of Mobility in Community-Dwelling Older Adults

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Peter C. Coyle, Subashan Perera, Valerie Lea Shuman, Jessie VanSwearingen, Jennifer Sokol Brach

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The Figure-of-8-Walk Test (F8WT) was recently introduced as a performance measure of the motor skill of walking. Prior work has shown that the F8WT captures aspects of mobility performance that are conceptually distinct from walking speed measured over a straight path. But, meaningful patient-centered cut-points to aid in its interpretation have not been developed and validated for the F8WT.

**Number of Subjects:** Community-dwelling older adults aged  $\geq 65$  years were recruited ( $n=421$ ) to participate in a cluster-randomized controlled trial comparing two exercise interventions to improve mobility. Participants were included if they could ambulate independently (with or without a cane) for household distances and had a usual walking speed  $\geq 0.60$  m/s.

**Materials and Methods:** For the purpose of these analyses, all participants were treated as one cohort. F8WT performance and self-reported global mobility and balance (responses = 'excellent', 'very good', 'good', 'fair', or 'poor') were assessed at baseline and 12-weeks (i.e. post-intervention). After 12-weeks, participants were called monthly for a year to assess incident falls, emergency department (ED) visits, and hospitalizations. Area under receiver operating characteristic curves were calculated using baseline data, with F8WT performance (i.e. completion time and number of steps) identifying different anchors derived from global mobility and global balance dichotomies (e.g. 'excellent' vs. 'very good/good/fair/poor'), to develop cut-points that had sufficient discrimination and optimized both sensitivity and specificity. For validation, F8WT cut-point thresholds were applied to 12-week data to classify those who performed well and poorly. Risk of negative outcomes occurring over the 1 year of follow-up were compared between those who performed well vs. poorly on the F8WT at 12-weeks.

**Results:** F8WT performance times of  $\leq 9.09$  and  $\leq 9.27$  s can identify those with 'excellent' (sensitivity=0.647; specificity=0.654) and 'excellent/very good' global mobility (sensitivity=0.649; specificity=0.648), respectively. A total number of steps  $\leq 17$  on the F8WT can identify those with 'excellent/very good/good' global balance (sensitivity=0.646; specificity=0.608). For all three cut-points, performing well was associated with a significantly lower incidence of falling (50-61% lower risk; p-values  $\leq 0.001$ ), ED visits (40-56% lower risk; p-values  $\leq 0.003$ ) and hospitalizations (28-46% lower risk; p-values  $\leq 0.010$ ).

**Conclusions:** For the F8WT, performance times of  $\leq 9.09$  and  $\leq 9.27$  s and number of steps  $\leq 17$  are suitable cut-points for identifying those with different levels of self-perceived mobility and balance. The performance classifications have meaningful prognoses, as performing well is associated with an approximately 30-60% reduced risk of negative outcomes.

**Clinical Relevance:** Clinicians may use these patient-centered cut-points with the F8WT to aid in their clinical decision-making about which patients may have mobility and balance limitations that increase the risk of poor outcomes.

## CSM 2019 Platform Abstracts

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**TITLE:** Long-Term Efficacy of Treatment Effects After Kyphosis Exercise and Posture Training Intervention for Age-Related Hyperkyphosis

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Wendy Beth Katzman, Amy Maria Elisabeth Gladin, Shirley Wong, Nancy E Lane

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Treatments that prevent worsening kyphosis are important due to the progressive nature of kyphosis with aging. We assessed long-term efficacy of treatment effects after a 3-month kyphosis exercise and posture training intervention among older adults with hyperkyphosis and investigated whether long-term treatment effects differ according to sex. Males and females have different characteristics associated with hyperkyphosis.

**Number of Subjects:** 112

**Materials and Methods:** In the original kyphosis intervention, 112 males and females enrolled in a waitlist design randomized controlled trial. One hundred and three participants, mean age 70 years and mean kyphosis 56 degrees, completed a twice weekly, 3-month, group exercise and posture training intervention, and were eligible to enroll in the follow-up study. We compared change in outcomes pre-post intervention to change post-intervention over the follow-up period. We stratified participants by sex and compared differences at both time points. Primary outcome was change in kyphometer-measured thoracic kyphosis. Secondary outcomes were change in lumbar lordosis, objective measures of physical function, and self-reported measures of physical activity and health-related quality of life (HRQoL).

**Results:** Forty-three participants, 42% of the eligible cohort, returned for follow-up, a mean  $3.0 \pm 0.7$  years after completing the original intervention. Kyphosis declined  $-1.5 \pm 7.8$  degrees post-intervention to follow-up, indicating improvement, and this change was no different than change pre-post intervention,  $p=0.17$ . Lordosis improved  $8.9 \pm 8.4$  degrees, more than the change pre-post intervention,  $p<0.001$ . Gait speed increased  $0.08 \pm 0.20$  m/s, Physical Activity Scale for the Elderly (PASE) measure of physical activity increased  $4 \pm 60$  points, and PROMIS mental health t-score measure of HRQoL increased  $1.1 \pm 6.7$  points, but these improvements were not significantly more than the change pre-post-intervention,  $p>0.05$ . Other measures of physical function, (modified physical performance test, timed up and go, and six-minute walk), and HRQoL (Scoliosis Research Society (SRS-30) self-image and PROMIS physical function and physical health) declined at follow-up, significantly more than the change pre-post-intervention,  $p \leq 0.05$ . Males and females responded equally well in kyphosis, lordosis and gait speed. At long term follow up females improved Time loaded standing versus males who declined  $p=.01$ , and males improved PROMS physical function, physical health and mental health versus females who declined  $p=.01$ ,  $p=.02$ ,  $p=.07$  respectively.

**Conclusions:** Kyphosis did not progress as expected with age in our follow-up study, a mean  $3.0 \pm 0.7$  years after a 3-month kyphosis intervention. There was long-term improvement in kyphosis, lordosis, gait speed in both males and females. Further investigation of long-term benefits of a short-term kyphosis exercise and posture training intervention are warranted.

**Clinical Relevance:** Older adults with hyperkyphosis who undergo a 12-week exercise and posture training intervention may slow the progression of age-related hyperkyphosis, improve lordosis and gait speed in the long term.

## CSM 2019 Platform Abstracts

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**TITLE:** The Continuity Assessment Record and Evaluation (CARE) Item Set: Predicting Discharge After Lower Extremity Fracture

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Cecelia R. Sartor-Glittenberg, Kathleen Ann Lovato, Curt Bay, Mario Vincent Diaz, Sierra Donaldson, Qasim Khan

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The purpose of this correlational study was to examine the Continuity Assessment Record and Evaluation (CARE) Item Set and fracture-related variables in predicting discharge setting in persons admitted to an inpatient rehabilitation facility (IRF) after a hip or femur fracture.

**Number of Subjects:** 157 adults, aged 18-97 years, admitted to an IRF in Arizona in 2016-2018 with a hip or femur fracture and examined using the CARE.

**Materials and Methods:** A retrospective chart review was conducted. Variables abstracted: age, sex, pre-fracture variables (living setting; cognitive, self-care, walking, and stair-climbing abilities; falls in past year), type of injury, time since onset, admission weight-bearing status, admission CARE cognition scores, admission and discharge CARE self-care and CARE mobility scores, falls after admission, length of stay, and discharge setting. Descriptive statistics were calculated. The Wilcoxon test was used to analyze change in CARE scores from admission to discharge. The exact version of the Pearson Chi-Square was used to test the relationship between the independent variables (age, sex, pre-fracture variables, weight-bearing status, falls after admission) and discharge setting. One-way ANOVA's were used to test change in CARE self-care and mobility and length of stay by discharge setting, as well as sex, pre-fracture function, admission CARE self-care and mobility scores, and weight-bearing status. Pairwise comparisons with Bonferroni adjustments were conducted.

**Results:** Data were analyzed for 157 individuals: 72.6% aged 63-87 years; 54.8% women; 87% hip fracture, 13% femur fracture; 68% weight-bearing as tolerated; 85.4% discharged home. Mean [SD] CARE self-care scores increased from baseline (22.25 [5.24] points) to discharge (34.18 [9.65] points,  $Z = 9.52, p < .001$ ). Mean [SD] CARE mobility scores increased from baseline (32.38 [10.9] points) to discharge (63.1 [20.65] points,  $Z = 16.25, p < .001$ ). Age, sex, weight bearing status, and pre-fracture cognitive, walking, stair-climbing abilities were not associated with discharge setting. Pre-fracture self-care ability was associated with discharge setting ( $\chi^2 = 16.9, p = .046$ ). Persons discharged home had a 6.4 point greater score on the admission CARE self-care than those discharged to a SNF (95% CI = 3.45-9.35,  $p < .001$ ). Those discharged home had a 12.6 point greater score on the admission CARE mobility than those discharged to a SNF (95% CI = 6.37-18.77,  $p < .001$ ). Persons discharged home had a 4.8 point greater gain in CARE self-care and a 17.4 point greater gain in CARE mobility compared to those discharged to a SNF (95% CI = 0.76-9.61,  $p = .046$  and 95% CI = 5.19-29.53,  $p = .003$ , respectively). Falls after admission was associated with discharge setting ( $\chi^2 = 12.97, p = .048$ ).

**Conclusions:** Pre-fracture level of self-care, admission CARE self-care and mobility, change in CARE self-care and mobility, and falls after admission were significantly different for those discharged to home or SNF.

**Clinical Relevance:** The CARE, a standardized functional assessment for persons admitted to an IRF, may be helpful in predicting discharge setting following hip or femur fracture.

## CSM 2019 Platform Abstracts

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**TITLE:** Aging Swimmers, How Do They Differ From Other Aging Athletes?

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Becca D. Jordre, Kristen McFarland, William E Schweinle, Shantel Lynn Norman, Jenifer Lynn Hall

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The purpose of this study was to examine the potential health benefits and risks associated with engagement in competitive swimming with aging as compared to other forms of sport training.

**Number of Subjects:** 2,346 (201 swimmers, 2,145 non-swimmers).

**Materials and Methods:** Data was collected from athletes at the National Senior Games, a multi-sport event for adults over age 50. Health history as well as physical performance measures were collected as a part of the Senior Athlete Fitness Exam (SAFE). The SAFE included waist circumference, waist to hip ratio, body mass index, grip strength, Five Times Sit to Stand Test, shoulder flexion range of motion, Thomas Test, gastrocnemius flexibility, self-selected walking speed, maximal walking speed and single leg stance under three conditions (eyes open, eyes closed and on a foam pad). Athletes registered to compete in swimming events were designated as swimmers while athletes registered in other sports were designated as non-swimmers. General linear models and chi square methods were used to compare groups.

**Results:** The average age of participants 68.18 (SD 9.2). Both swimming and non-swimming athletes reported more than 300 minutes each week of cardiovascular training and more than 60 minutes each week of strength training. Male swimmers reported a significantly higher incidence of osteoporosis ( $p=.03$ ), high cholesterol ( $p<.01$ ), stroke ( $p<.01$ ), and cancer ( $p<.01$ ), while female swimmers reported a higher incidence only of breathing problems, such as asthma, ( $p<.01$ ) when compared to non-swimming athletes. Swimmers demonstrated significantly lower hand grip strength than their non-swimming peers with male and females scoring 2.47 kg and 2.11 kg lower, respectively. Self-selected walking speed was significantly slower in swimmers (1.38 m/s) vs. non-swimmers (1.43 m/s) ( $p<.01$ ). Swimmers also demonstrated significantly lower single leg balance in the eyes open condition than their non-swimming peers ( $p=.02$ ). Swimmers did excel in shoulder flexion range of motion demonstrating, on average 3.28 degrees more shoulder flexion than their peers ( $p<0.0001$ ). All other aspects of health history and SAFE testing were similar between the groups.

**Conclusions:** Aging swimmers demonstrate similar volumes of training and enjoy similar physical health benefits when compared to other aging athletes. SAFE screening identified both groups as performing beyond community-dwelling norms on all measures. Of concern is a higher incidence of osteoporosis in male swimmers which, combined with lower grip strength may indicate the need for more varied training in this population and the need for bone health screening, particularly in men. Slower walking speed and more limited single leg balance may also indicate the need for cross-training to assist this population in translating their exercise efforts toward broader injury prevention and health promotion.

**Clinical Relevance:** Providers treating aging athletes who choose swimming as their primary mode of exercise may apply these findings when making evaluative decisions.

## CSM 2019 Platform Abstracts

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**TITLE:** Walking Speed Reserve As a Screen for Fall Risk and Co-Morbidities in Aging Athletes

**CURRENT SECTION:** Geriatrics

**AUTHOR:** Becca D. Jordre, Allison Nichole Deering, Avery Beth Allen, Jacob Wayne Munger, William E Schweinle

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Walking speed reserve (WSR), the difference between maximal and self-selected walking speed has been investigated in older adults to predict frailty, fall risk and overall health status. While WSR has demonstrated some utility as a screening tool for special populations, it has shown limitations when applied to the general population of aging adults due to limitations in the range of individual walking speeds. When only small differences exist between maximal and self-selected walking speeds, WSR appears less useful. Aging athletes are a unique population of community-dwelling older adults who engage in high volumes of purposeful exercise and sport competition. We hypothesize that WSR may be more useful as a screening tool for aging athletes as they are likely to demonstrate greater variability in walking speeds. The purpose of this study is to explore the utility of WSR as a screen for fall risk and co-morbidities in aging athletes.

**Number of Subjects:** Subjects consisted of 2,049 athletes competing in National Senior Games events. Subject mean age was 68.07 (SD 9.25).

**Materials and Methods:** All subjects in this observational cohort study signed an IRB-approved, written informed consent. All subjects were athletes registered to compete in National Senior Games competition between 2013 and 2017. Subject age, health history and fall history were collected prior to testing WSR. Self-selected walking speed and maximal walking speed were measured on a ten meter walkway with an additional five meters used each for acceleration and deceleration zones. WSR was calculated as the difference between maximal and self-selected speed for each subject. Descriptive statistics, logistic regression, ROC analyses and binomial approximation were used to analyze the data.

**Results:** Mean WSR in this population was 0.71 meters/second (m/s). WSR was significantly associated with a history of falling ( $p < .0001$ ), cardiovascular disease ( $p < .0001$ ), low bone density ( $p < .0001$ ), and diabetes mellitus ( $p < .0116$ ). No association was found between WSR and self-reported breathing problems, such as asthma ( $p = .6368$ ) or cancer history ( $p = .3133$ ). All significantly associated health conditions, including falls were combined into a dichotomous 'co-morbidity risk' variable which, when compared to WSR demonstrated an odds ratio (OR) of 2.3 ( $p < .0001$ ). Applying a WSR cut score of .33 m/s to this population predicted the 'co-morbidity risk' variable with a sensitivity of 72% and specificity of 41% and produced a positive predictive value of 67%.

**Conclusions:** When compared to the median WSR of .24 m/s most recently reported for community dwelling older adults, more than 90% of aging athletes exceeded this threshold. WSR appears significantly higher among aging athletes than in community-dwelling older adults. A WSR threshold of less than .33 m/s appears most consistent with aging athletes who have had a fall or who have other co-morbidities.

**Clinical Relevance:** WSR may be useful when screening the health and fall risk of high-functioning older adults such as those who exercise regularly or participate in competitive sports.

## CSM 2019 Platform Abstracts

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**TITLE:** A Feasibility Study: Effects of an Online Continuation Program for a Community-Based Fall Prevention Program

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Susan Wenker

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Stepping On, an exercise-based falls prevention program, significantly reduced falls among community-dwelling older adults at 3-months. To improve long-term exercise adherence, we developed Stepping Online, a web-based continuation program that offered Stepping On graduates including avatar and guest expert videos, falls tips, discussion forum and an exercise tracker log to decrease falls risks and via improved exercise adherence. We hypothesized an online continuation exercise program will decrease fall frequency and improve exercise adherence.

**Number of Subjects:** 147 Stepping On graduates were invited; 43 (29%) enrolled (20 control, 23 treatment).

**Materials and Methods:** This 6-month pilot was a group-level randomized control trial. We enrolled Stepping On leaders from 7 Wisconsin counties and recruited their participants; after baseline assessments we randomized Stepping On classes to a control or treatment group, providing laptops and internet if needed. At 0, 3 and 6 months, exercise adherence was assessed by survey; a physical or occupational therapist (blinded to group assignment) assessed physical performance via the Short Physical Performance Battery (seconds), tandem walk errors, and gait speed (ft/second); perceived change for strength, and inside and outside balance was assessed by 6-month survey via the Global Rate of Change (-7 to +7 scale). Falls were measured by monthly calendar. To assess participants' Experience of Stepping Online, use of exercise videos and exercise logs was automatically collected; participants rated their helpfulness and the perceived safety of doing new exercises online using a 0 to 4-point Likert scale in a telephone interview.

**Results:** As predicted, the Stepping Online group improved across the measures. Exceeding predictions, mixed effects regression models found that Stepping Online vs. controls had significant positive effects on: Exercise Adherence at 3 months (strength: 3.29/week vs. 2.11, CI 0.32 - 2.03 and balance 4.29/week vs. 2.53, CI 0.66 - 2.86); Tandem Walk Errors at 3 months (2.31 vs. 6.67, CI: -6.29 to -2.47) and at 6 months (2.53 vs. 6.49, CI -6.39 to -1.56); Gait Speed at 6 months (0.96 vs. 0.82 ft/second, CI 0.06 - 0.22); perceived change in Inside Balance at 6 months (4.29 vs. 2.40, CI 0.06 - 3.71). Within-subjects logistic regression modeling found that Stepping Online decreased falls (0.28 vs. 0.40) at 6 months, but not significantly (CI 0.27- 2.57). Stepping Online experience: Participants viewed Avatar videos a median of 15 (2 - 52) times and logged 307 (1 - 1,223) exercises as completed. The mean scores for helpfulness were 3.88 (SD 0.33) for the Avatar videos and 3.13 (SD 1.1) for the Exercise Log. Participant rated doing new exercises safely at 3.87 (SD 0.35).

**Conclusions:** Stepping Online significantly improved exercise adherence and fall-related physical performance and may serve as an important adjunct to exercise classes for fall prevention.

**Clinical Relevance:** Stepping Online may be a model to continue other on-line health promotion programs.

## CSM 2019 Platform Abstracts

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**TITLE:** Perceived Barriers to Fall Prevention Among Older Adults, Caregivers, and Healthcare Providers: A Qualitative Study

**CURRENT SECTION:** Geriatrics

**AUTHORS:** Chandler Dickinson, Monica Celeste Leach, Catherine Celeste Quatman-Yates, Michelle Hislop, Deb A Kegelmeyer, Anne Dillman Kloos, Carmen Quatman, Jessica Wiseman

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Falls are a significant healthcare issue in the United States, with a prevalence of up to 30% in older adults. Physical therapists and other healthcare providers play a major role in planning and implementing fall prevention strategies. However, the success of fall prevention efforts is complex and may necessitate multi-stakeholder facilitation of both risk identification and strategy implementation. The aim of this study was to identify multi-stakeholder perceptions of barriers that limit uptake of fall prevention strategies for community-dwelling older adults.

**Number of Subjects:** Older adults (n=15), caregivers (n=16), and healthcare providers (n=25).

**Materials and Methods:** Semi-structured focus groups were conducted with three different stakeholder groups: 1) older adults (age 60 or older), 2) caregivers (e.g., children, spouses), and 3) healthcare providers (e.g., physicians, physical therapists, occupational therapists, paramedics). Focus group discussions were recorded, transcribed verbatim, and analyzed via open-coding by two independent coders in order to identify common themes within and across stakeholder groups. Initially, three focus groups were held for each group (~1 hour each). Later, a fourth focus group was held for the healthcare provider group to help ensure adequate theme saturation.

**Results:** Key themes reported across the groups included: reluctance to acknowledge or lack of awareness of fall risk, lack of awareness of fall prevention strategies, difficulty with access or transportation to available programs, perception of financial burden of strategies, a disconnect in fit between strategies offered and actual needs, stigma of being perceived as old, and concerns over loss of independence (i.e., being forced to leave home or having to change the décor/layout). Several male older adults expressed a reluctance to participate in balance classes due to the perception of classes being “female-oriented.” Caregivers described a lack of knowledge about fall events their loved ones experienced and serving in a caregiving role while being geographically separated from their loved ones as key barriers. Healthcare providers described a lack of insight into the actual home environment, significant fragmentation in the healthcare system limiting identification and treatment capacity, and gaps between having a fall prevention recommendation and being able to facilitate it.

**Conclusions:** The results of this study illuminate a variety of perceived barriers and offer new insights into how to design better solutions for fall prevention efforts. A multi-stakeholder consideration of these barriers provides a rich and robust view of the various factors that may play into the breakdowns in uptake of recommendations. A key barrier to overcome is healthcare system fragmentation in order to improve identification of at-risk individuals and facilitate uptake of fall prevention strategies.

**Clinical Relevance:** Understanding the barriers older adults may face can help physical therapists make more informed choices on how to facilitate successful uptake of fall prevention recommendations.