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The Impact of Function Focused Care and Physical Activity on Falls in Assisted Living Residents

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Abstract

Background: There continues to be a belief among nurses, patients, and families that physical activity increases the risk of falling.

Purpose: The purpose of this study was to test the hypothesis that controlling for age, function, cognition, medication use, gender, comorbidities, and cognition, residents who are exposed to Function Focused Care for Assisted Living (FFC-AL-EIT) and engage in moderate levels of physical activity would not be more likely to fall.

Methods: This was a secondary data analysis using data from the first two cohorts of a randomized trial testing FFC-AL-EIT in the United States.

Results: The study included 381 residents, the majority of whom were female (70%), white (97%), with a mean age of 87.72 (SD=7.47). Those who engaged in more moderate intensity physical activity were 1% less likely to fall (odds ratio = .99, p =.03). There was no significant association between exposure to function focused care and falling (odds ratio=1.58, p =.09).

Conclusion: There was no indication that those who were exposed to function focused care or those who engaged in moderate level physical activity were more likely to fall. In fact engaging in moderate level physical activity was noted to be slightly protective of falling.

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Keywords

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Assisted living communities, also referred to as congregate care, independent supportive living, retirement care, supportive housing in the United States and Canada, are residences that provide housing and supportive services, 24-hour supervision, and at least two meals a day to meet the individual needs of residents. Care is provided by direct care workers, often, but not always, under the supervision of licensed nurses. Approximately 15 to 50% of older adults living in assisted living (AL) communities in the United States experience a fall over a 6 to 24 month period (Williams et al., 2018; Zimmerman et al., 2017). High rates of falls are noted as well in Canadian assisted living facilities (Macgregor, et al., 2014; Maxwell et al., 2013; Maxwell, et al., 2015). The cause of these falls generally involves multiple factors at the resident level as well as the facility or environment level. Resident level factors most commonly contributing to falls include older age, evidence of frailty (e.g., muscle weakness, gait and balance disorders), cognitive impairment, a history of falls, use of an assistive device, visual and hearing impairment, depression, and the use of certain medications (antidepressants, anxiolytics, antipsychotics, diuretics or any medication that can cause orthostatic hypotension) (Cameron, Bowles, Marshall, & Andrew, 2018; Schonfeld et al., 2018; Yang et al., 2018). At the environment level, factors contributing to falls include paths that are twisted, cluttered areas, slippery areas, and problems with assistive devices (Cameron et al., 2018). There is not consistent evidence that nurse staffing or level of nurse on the units is associated with falls (Backhaus et al., 2017; Okeorji, 2017).

Interventions to Decrease Falls

Given the many factors that are associated with risk for falls and falling, it follows logically that multi-component interventions are needed to decrease risk and incidence of falls (Cameron et al., 2018; Francis-Coad, Etherton-Beer, Burton, Naseri, & Hill, 2018). The aspects of multi-component interventions that appear to decrease falls include exercise or physical activity programs, particularly exercise interventions focused on improving balance; evaluation and management of medical problems such as degenerative joint disease; medication adjustment to eliminate drugs believed to increase fall risk; and environmental modifications such as removing clutter and optimizing chair and bed height (Cameron et al., 2018). In addition, staff education has been included in multi-component interventions for fall prevention (Lamb, Jørstad-Stein, Hauer, & Becker, 2005). Despite the evidence that these interventions can decrease fall risk, they are not easily implemented into practice (Zimmerman et al., 2017). Moreover, there continues to be a pervasive belief among nurses, patients, and families that physical activity increases the risk of falling (Shannon, 2018; Tuvemo, Martin, Anens, Johansson, & Hellström, 2018).

Function Focused Care as a Fall Prevention Intervention

Function focused care is a philosophy of care that teaches direct care workers to evaluate older adults' underlying capability with regard to function and physical activity and optimize their participation in all activities (Resnick, Galik, & Boltz, 2013). Examples of function

focused care interactions include: modeling behavior for residents (e.g., oral care, eating); providing verbal cues during dressing; walking a resident to the dining room rather than transporting via wheel-chair; doing resistance exercises with residents prior to meals; and providing recreational physical activity (e.g., Physical Activity Bingo). A review article evaluating the impact of function focused care (Resnick et al., 2013) concluded that function focused care was beneficial for older adults. Benefits may include improving or maintaining function, mood and behavior (Boltz, Resnick, Chippendale, & Galvin, 2014; Galik, Resnick, Lerner, Hammersla, & Gruber-Baldini, 2015). There was no evidence that function focused care increased resident falls or adverse events (Galik et al., 2015; Resnick, Galik, Gruber-Baldini, & Zimmerman, 2011). Moreover, implementing function focused care decreased transfers to the hospital for non-fall related events (Resnick et al., 2011).

The purpose of this study was to explore the impact of implementation of a Function Focused Care intervention in assisted living (FFC-AL-EIT) and participation in moderate level physical activity on falls among residents in assisted living. Based on prior research, we hypothesized that controlling for age, function, cognition, medication use, gender, comorbidities, and cognition, residents in AL communities exposed to FFC-AL-EIT and those who engaged in moderate levels of physical activity would not be more likely to fall over a four month period.

Methods

Design

This study used data from the first two cohorts of a randomized trial in the United States testing the dissemination and implementation of the Function Focused Care for Assisted Living study using the Evidence Integration Triangle (FFC-AL-EIT). Data used included baseline factors associated with falls and whether or not the individual experienced a fall over the first four months following implementation of FFC-AL-EIT. AL settings were invited to participate if they: (1) had at least 25 beds; (2) identified a staff member (i.e., registered nurse, licensed practice nurse, direct care worker, social worker) to work with the study team in the implementation of the FFC-AL-EIT intervention; and (3) were able to access email and websites via a phone, tablet, or computer. Sites were randomized to treatment or an Education Only (EO) control.

Ethical Considerations

This study was approved by a University based institutional review board. AL residents were eligible to participate if they were 65 years of age or older, able to speak English, currently living in a participating assisted living facility at the time of recruitment, and able to recall at least one out of three words as per the Mini-Cog (Borson, Scanlan, Chen, & Ganguli, 2003). Residents were excluded if they were enrolled in hospice. A five-item Evaluation to Sign Consent (Resnick et al., 2007) questionnaire was used to determine the residents' capacity to provide consent to participate in the study. If the resident did not pass the Evaluation to Sign Consent, he or she was asked to assent to the study and consent was obtained from the resident's legally authorized representative. In addition, precautions were taken to ensure that all research materials were inaccessible to anyone other than the investigators. No

personal identifiers were connected with the data and a unique study identification number was assigned to each participant. Any relevant hard data and consent related information was stored in locked files and on study computers, with access limited to the investigators and key study personnel. We used the Research Electronic Data Capture (REDCap) system for data management which has strict computer security procedures. In additional all data files were used with multiple levels of password protection.

Sample

In cohorts one and two, a total of 508 residents were recruited into the study from 54 assisted living settings across Maryland, Pennsylvania, and Massachusetts. At four months there were 437 participants still alive and/or living in the settings. From these, we had complete data on 381 (87%) individuals with the majority of the missing data being from the Motionwatch 8. Reasons for missing Motionwatch 8 data included refusal to wear the Motionwatch 8 or removal of the Motionwatch 8 prior to collecting the first 24 hours of data. The Little's test, which tests the null hypothesis that missing data is missing completely at random was done. A p value of less than 0.05 means the data are not missing completely at random. Based on the Little's test the data were found to be missing completely at random (chi square = 18.78, df = 17, and p =.34).

FFC-AL-EIT Intervention

FFC-AL-EIT is a 12 month intervention coordinated and implemented by a Research Nurse Facilitator (RNF) and involves a four step process including: (I) Environment and Policy/ Procedure Assessments; (II) Education; (III) Developing Function Focused Goals; and (IV) Mentoring and Motivating (see Table 1). Prior to implementation of the four steps there is an initial meeting with an identified Stakeholder team (stakeholders usually include the administrator, nursing director, an in-house staff identified as the function focused champion, an activity director, social worker if available, or others in leadership roles within the setting). During this meeting an overview of the four steps of FFC-AL-EIT is provided and a brainstorming session done to identify facility specific goals for the project. The RNF works with the identified facility champion monthly for approximately 2 hours to implement the four steps of FFC-AL-EIT. The RNF continues to meet with the Stakeholder team briefly every month (up to 30 minutes) to keep them apprised of the function focused care related activities. While the four steps of FFC-AL-EIT are introduced sequentially, they each continue to be utilized to facilitate implementation of function focused care within the setting. For example, education may be delivered in a formal in-service session and then additional education provided to families, residents and new staff throughout the 12 month period. The stakeholders and champions are also sent weekly Tidbits via email from the research team. The Tidbits provided innovative approaches to engage residents in functional tasks and physical activity. Examples of Tidbits include engaging residents in routine daily work within the setting, such as vacuuming or cleaning tables; playing fly swatter badminton; and providing music and dance activities throughout the day.

Measures

Measures for the parent study were collected at baseline, 4, and 12 months post implementation of the intervention, although only baseline data and 4 month falls were used

in this analysis. The following resident descriptive information was obtained: age, gender, number of comorbidities, falls over a 4 month period, whether or not the individual was on an antipsychotic, anxiolytic, antidepressant, sedative-hypnotic or an opioid, functional status was obtained using the Barthel Index (Mahoney & Barthel, 1965) and cognitive status was based on the Mini-Cog screening tool, specifically the individual's ability to recall 0, 1, 2, or 3 out of 3 words (Borson et al., 2003). The Barthel Index (Mahoney & Barthel, 1965) includes 10-items that address activities of daily living (e.g., bathing, dressing). Items are weighted to account for the amount of assistance required. A score of 100 indicates complete independence. Prior psychometric testing noted that estimates of internal consistency ranged from alpha coefficients of 0.62 to 0.80, inter-rater reliability was good based on an intra-class correlation of 0.89 between two observers; and validity was based on correlations with the Functional Inventory Measure ($r = 0.97$, $p < .05$) (Mahoney & Barthel, 1965). Data was obtained via verbal report of function from the direct care worker caring for the resident on the day of testing.

The Mini-Cog was developed as a brief screening tool to identify those with likely dementia. The Mini-Cog has sensitivity ranging from 76–99%, and specificity ranging from 89–93% with a 95% confidence interval (Borson et al., 2003). Lastly, physical activity was based on accelerometry data collected from the Motionwatch 8 (CamNtech, 2018). The MotionWatch 8 is a compact, lightweight, wrist-worn activity monitoring device used to document physical movement. The Motionwatch 8 contains a miniature accelerometer to allow measurement and recording of physical movement of the wrist, which provides a close correlation to whole body movement. MotionWatch 8 data included the time participants spent in moderate activity based on previously established, reliable and valid cutpoints for different levels of activity for older adults (Landry, Falck, Beets, & Liu-Ambrose, 2015). The Motionwatch 8 was placed on participants for 5 days with data evaluated for the three full days between placement and removal (i.e., days 2, 3, and 4). There was no significant difference in activity on days 2, 3, and 4 so day 2 data were used for all analyses.

Data Analysis

Descriptive analyses were done to describe the sample. Univariate logistic regression was done to determine the association of all variables with whether or not the resident experienced a fall. Binary logistic regression was done to determine if, controlling for age, gender, number of comorbidities, cognitive impairment, and function, being on an antidepressant, an anxiolytic, a sedative-hypnotic, an antipsychotic, or an opioid, moderate level physical activity or being exposed to function focused care were associated with a fall. Binary logistic regression using a Block entry method was employed, and a 95% confidence interval (CI) was used to establish statistical significance in the regression analysis. The Hosmer-Lemeshow fit test was used to evaluate model fit (Hosmer & Lemeshow, 2000). Lower values (and nonsignificance) indicate a good fit to the data and, therefore, good overall model fit.

Results

As shown in Table 2, the majority of the participants were female (70%), white (97%) and the mean age was 87.72 (SD=7.47) and participants had a mean of 5.00 (SD=2.00) comorbidities. Overall, the participants had a mean score of 2.44 (SD=7.50) on three item recall on the Mini-Cog, and functionally needed some help with activities of daily living based on a mean score of 64.18 (SD=19.05) on the Barthel Index. They engaged in 44.29 (SD=75.98) minutes daily of moderate level physical activity. With regard to medications, 14 (4%) were on sedative hypnotics, 135 participants (35%) were on antidepressants, 24 (6%) were on anxiolytics, 25 (7%) were on opioids, and 38 (10%) were on antipsychotic medications. At 4 months post implementation of the intervention, the majority of the participants had no falls (73%) and 93 individuals (27%) had at least one fall. Table 3 provides the unadjusted results bivariate correlations between all predictive variables and whether or not the individual experienced a fall. Only age ($r = .12$, $p = .02$) and moderate physical activity ($r = -.12$, $p = .03$) were associated with having a fall.

Results of the logistic regression, adjusted and unadjusted models, are shown in Table 3. In the unadjusted model, only age (β = .05, odds ratio = 1.05, *95% CI 1.01–1.09, p* =.01), being on an anxiolytic (β = .94, odds ratio = 2.60, *95% CI 1.07 – 6.37, p* =.04) and time spent in moderate level physical activity (β = −.01, odds ratio = .99, *95% CI .99–1.00, p* =.03) were significantly associated with having a fall. The adjusted model correctly classified fallers 73% of the time and there was a good fit of the data to the model ($p = .10$). Controlling for age, gender, comorbidities, medication use, cognition and function, time spent in moderate physical activity was negatively associated with falls such that for every unit increase in minutes of moderate level physical activity there was a 1% decrease in the risk of falling (β = −.01, odds ratio = .99, *95% CI .99 – 1.00, p* =.03). There was no significant association with being exposed to function focused care and falling (β = .46, odds ratio = 1.58, *95% CI .93 – 2.7, p* =.09). Among the variables controlled for, only age (β = .04, odds ratio = 1.05, *95% CI 1.01–1.11, p* =.02) and being on a narcotic were significantly associated with falling (β = −1.48, odds ratio = .23, *95% CI .06 – .82, p* =.02). Being on an anxiolytic approached significance in the adjusted model (β = .92, odds ratio = 2.50, *95% CI .97 – 6.5, p* =.06) and, as noted above, was significant in the unadjusted model. Those who were one year older were 5 percent more likely to fall and those who were on a narcotic were 77 percent less likely to fall.

Discussion

The null hypothesis in this study was supported in that there was no indication that those who were living in settings exposed to function focused care or those who engaged in moderate level physical activity were more likely to fall. In fact engaging in moderate level physical activity was noted to be slightly protective of falling. These findings support other work suggesting that exercise does not increase the risk of falls and in some studies those who do exercise have fewer falls (Lee & Kim, 2017; Tricco, Thomas, Veroniki, & et al, 2017). Across all these studies different types of exercise were performed with some focusing on resistance and balance exercise and some on moderate intensity aerobic activity. There is no single exercise program or activity that can be utilized as the gold standard for

fall prevention. Rather, an individualized approach may be needed to address the needs or weaknesses of the individual and his or her underlying capabilities (Bauman, Merom, Bull, Buchner, & Fiatarone Singh, 2016). The current guidelines from the 2018 Physical Activity Advisory Committee report for adults recommend at least 150 minutes to 300 minutes a week of moderate-intensity, or 75 minutes to 150 minutes a week of vigorous-intensity aerobic physical activity and muscle-strengthening activities on two or more days a week (The Physical Activity Advisory Committee, 2018). Older adults specifically should do multicomponent physical activity that includes balance training as well as aerobic and muscle-strengthening activities (Piercy, Troiano, Ballard, & et al, 2018). Ongoing research is certainly needed to help guide individuals in the types of exercise that will be most likely to help them to prevent a fall.

Psychotropic medications were not associated with falls in this study. The findings related to psychotropic medication use and falls in prior studies have been inconsistent. In one study antidepressants were associated with falls and benzodiazepines were protective of falls (Cameron et al., 2018). In other studies the number of potentially inappropriate psychotropic medications was associated with falls (Renon-Guiteras et al., 2018) as were medications that resulted in orthostatic hypotension (Ryan-Atwood et al., 2017). In the current study there was an association between the use of opioids and falls such that opioid use decreased the risk of falling. Conversely, prior research has noted that there was an increased risk of falling associated with opioid use (Daoust et al., 2018; Hunnicutt et al., 2018; Machado-Duque, Castaño-Montoya, Medina-Morales, Castro-Rodríguez, & González-Montoya, 2018) or in one study of community dwelling older men there was no noted association between opioid use and falling (Krebs et al., 2016). These inconsistencies may be due to whether or not the individual was naïve to the drug, whether an opioid was combined with other psychoactive medications, and/or whether or not there were other risk factors for falls such as orthostatic hypotension, vision problems, pain, or altered balance (Altintas, Aslan, Sısman, & Kesgin, 2018; Musich, Wang, Slindee, Saphire, & Wicker, 2018). Although opioid use may be associated with the risk of falls, pain is likewise associated with falls due to the impact it can have on mobility and balance (Altintas et al., 2018; Picorelli, Hatton, Gane, & Smith, 2018). It is possible, therefore, that the reason for the decreased risk of falling with opioid use in this study may be due to appropriate use of these drugs as a way in which to relieve pain and thereby optimize function.

In addition to psychotropic medications, comorbidities, gender, and cognition were not associated with falls in this study. Prior studies considering the association between falls and gender have also been inconsistent with some studies suggesting that males are at a greater risk of falling (Cameron et al., 2018) while others reported that women were more likely to experience a fall (Chippendale & Chang, 2018; Sotoudeh, Mohammadi, Mosallanezhad, Viitasara, & Soares, 2018). Most studies evaluating factors associated with falls control for gender and it is anticipated that gender associations are likely to be sample specific (Goh, Nadarajah, Hamzah, Varadan, & Tan, 2016). Likewise in some studies comorbidities are noted to be associated with falls and in others there is no association (Galik, Holmes, & Resnick, 2018; Urrunaga-Pastor et al., 2018). Cognitive status tends to be associated with falls such that those who are impaired, particularly those with mild impairment, are more likely to sustain a fall (Hsu et al., 2018). In the current study we used the single 3 out of 3

word recall item from the Mini Cog to describe cognitive status and this may not have been sensitive enough to differentiate those with mild, moderate, or severe impairment. Further, the level of cognitive screening used in this study did not assess frontal lobe function and the individual's ability to plan activities and monitor safety which would be more likely to contribute to a fall than short term memory issues.

The model correctly classified fallers versus nonfallers 73% of the time and the model fit the data. There are, however, additional variables that could be considered as possible factors that influence falls that were not included in this study. Specifically, fatigue, pain, vision and hearing, knowledge and beliefs about risk factors for falls and fall prevention interventions should be considered in future research (Davidson & Guthrie, 2019; Schonfeld et al., 2018; Tuvemo et al., 2018).

The participants in this study engaged in 44.29 (SD=75.98) minutes daily of moderate level physical activity based on Motionwatch 8 data. This exceeds the daily recommendation for time spent in physical activity noted in the 2018 Physical Activity Advisory Committee report to the Office of Health and Human Services (The Physical Activity Advisory Committee, 2018) as described above. The Motionwatch 8 is worn on the wrist as movement of the arms is considered to be consistent with overall body movement. We anticipate that arm movement associated with activities such as bed making, knitting, and playing the piano were included as moderate level physical activity thus inflating the amount time spent in this level of activity. Moreover, the calculation of exercise intensity (kilocalories spent to be indicative of moderate level activity) in this study was based on norms set by older adults living in the community with moderate level physical activity as > 562 to 1020 counts per minute (Landry et al., 2015). This is more liberal than the traditional cut points of moderate level activity ranging from 2690 to 6166 counts per minute established by Freedson and used as the default in devices such as the Actigraph (Freedson, Melanson, & Sirard, 1998). Counts are the unit of measurement used to evaluate activity when calculated by any type of actigraph. The device counts the number of times the waveform crosses 0 for each time period being evaluated. Ongoing research is needed to establish the most appropriate cutpoints to indicate moderate level physical activity among older adults.

Study Strengths and Limitations

This study included older adults in assisted living settings from three different states who consented to participate in a study focused on optimizing function and physical activity. The findings, therefore, cannot be generalized to all assisted living residents. Further, while assisted living settings are similar in Canada to those in the United States there may be differences in the residents and caregivers that might influence falls. The study was also limited as participants had to be able to recall at least 1 out of 3 words, thus excluding those with severe cognitive impairment. Falls and assessments of functional performance were based on documented reports provided by the staff versus direct observation by the evaluators and therefore may have been biased by recall. The use of the Landry et al., (Landry et al., 2015) calculation for moderate level physical activity in the Motionwatch 8 may have inflated the actual amount of time the participants engaged in moderate level physical activity. Lastly, this was a secondary data analysis of a study focused on optimizing

function and physical activity and many of the risk factors for falls were not included such as vision and hearing impairment, pain, or the presence of orthostatic hypotension. Despite these limitations, the findings provide additional support that moderate intensity physical activity and exposure to function focused care interventions do not increase the risk of falls and moderate level physical activity may protect older individuals in assisted living from falling.

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References

Altintas H, Aslan G, Sısman N, & Kesgin M (2018). Effects of pain and sleep quality on falls among nursing home residents in Turkey. Research in Gerontological Nursing, 11(5), 257–264. [PubMed: 30230519]

Backhaus R, van Rossum E, Verbeek H, Halfens R, Tan F, Capezuti E, & Hamers J (2017). Relationship between the presence of baccalaureate-educated RNs and quality of care: a cross-sectional study in Dutch long-term care facilities. BMC Health Services Research, 17, 1–9. [PubMed: 28049468]

Bauman A, Merom D, Bull F, Buchner D, & Fiatarone Singh M (2016). Updating the evidence for physical activity: Summative reviews of the epidemiological evidence, prevalence, and interventions to promote “active aging”. The Gerontologist, 56(52), S268–S280. [PubMed: 26994266]

Boltz M, Resnick B, Chippendale T, & Galvin J (2014). Testing a family-centered intervention to promote functional and cognitive recovery in hospitalized older adults. Journal of the American Geriatrics Society, 62(12), 2398–2407. [PubMed: 25481973]

Borson S, Scanlan J, Chen P, & Ganguli M (2003). The Mini-Cog as a screen for dementia: Validation in a population-based sample. Journal of the American Geriatrics Society, 51, 1451–1454. [PubMed: 14511167]

Cameron E, Bowles S, Marshall E, & Andrew M (2018). Falls and long-term care: A report from the care by design observational cohort study. BMC Family Practice, 19(1). Available at: https://www.ncbi.nlm.nih.gov/pubmed/29793427. Last accessed January, 2019.

CamNtech. (2018). The Motionwatch8. Available at: https://www.camntech.com/products/motionwatch/motionwatch-8-overview?gclid=EAIaIQobChMImceDyune3gIVCySGCh36BQSgEAAYASAAEgKktfD_BwE. Last accessed January, 2019.

Chippendale T, & Chang D (2018). Characteristics and fall experiences of older adults with and without fear of falling outdoors. Aging & Mental Health, 22(6), 849–855. [PubMed: 28393552]

Daoust R, Paquet J, Moore L, Émond M, Gosselin S, Lavigne G, et al. (2018). Recent opioid use and fall-related injury among older patients with trauma. Canadian Medical Association Journal,190(16), E500–506. [PubMed: 29685910]

Davidson J, & Guthrie D (2019). Older adults with a combination of vision and hearing impairment experience higher rates of cognitive impairment, functional dependence, and worse outcomes across a set of quality indicators. Journal of Aging & Health, 31(1), 85–108. [PubMed: 28805100]

Francis-Coad J, Etherton-Beer C, Burton E, Naseri C, & Hill A (2018). Effectiveness of complex falls prevention interventions in residential aged caresettings: A systematic review. JBI Database of Systematic Reviews & Implementation Reports,16(4), 973–1002. [PubMed: 29634516]

Freedson PS, Melanson E, & Sirard J (1998). Calibration of the Computer Science and Applications, Inc. accelerometer. Medicine and Science in Sports and Exercise, 30(5), 777–781. [PubMed: 9588623]

Galik B, Resnick B, Lerner N, Hammersla M, & Gruber-Baldini A (2015). Function Focused Care for assisted living residents with dementia. The Gerontologist, 55(Supplement 1), S13–S26. [PubMed: 26055774]

Galik E, Holmes S, & Resnick B (2018). Differences between moderate to severely cognitively impaired fallers versus nonfallers in nursing homes. American Journal of Alzheimer's Disease & Other Dementias, 33(4), 247–252.

Goh H, Nadarajah M, Hamzah N, Varadan P, & Tan M (2016). Falls and fear of falling after stroke: A case-control study. Physical Medicine and Rehabilitation: Journal of Injury, Function & Rehabilitation, 8(12), 1173–1180.

Hosmer D, & Lemeshow S (2000). Applied Logistic Regression. Wiley Press, New York, NY.

Howe AL, Jones AE, Tilse C (2013). What 's in a name? Similarities and differences in international terms and meanings for older peoples' housing with services. Ageing & Society, 33(4), 547–578.

Hsu B, Bleicher K, Waite L, Naganathan V, Blyth F, Handelsman D, et al. (2018). Community-dwelling older men with dementia are at high risk of hip fracture, but not any other fracture: The Concord Health and Aging in Men Project. Geriatrics & Gerontology International, 18(10), 1479–1484. [PubMed: 30160054]

Hunnicutt J, Hume A, Liu S, Ulbricht C, Tjia J, & Lapane K (2018). Commonly initiated opioids and risk of fracture hospitalizations in united states nursing homes. Drugs & Aging, 35(10), 925–926. [PubMed: 30187291]

Krebs E, Paudel M, Taylor B, Bauer D, Fink H, Lane N, & Ensrud K (2016). Osteoporotic Fractures in Men (MrOS) Study Research Group. Journal of General Internal Medicine, 31(5), 463–469. [PubMed: 26754689]

Lamb S, Jørstad-Stein E, Hauer K, & Becker C (2005). Development of a common outcome data set for fall injury prevention trials: The Prevention of Falls Network Europe consensus. Journal of the American Geriatrics Society, 53(9), 1618–1622. [PubMed: 16137297]

Landry G, Falck R, Beets M, & Liu-Ambrose T (2015). Measuring physical activity in older adults: calibrating cut-points for the MotionWatch 8((c)). Frontiers in Aging Neuroscience, 7.

Lee S, & Kim H (2017). Exercise interventions for preventing falls among older people in care facilities: A meta-analysis. Worldviews on Evidence-Based Nursing, 14(1), 74–80. [PubMed: 27984675]

Machado-Duque M, Castaño-Montoya J, Medina-Morales D, Castro-Rodríguez A, & González-Montoya A (2018). Association between the use of benzodiazepines and opioids with the risk of falls and hip fractures in older adults. International Psychogeriatrics, 30(7), 941–946. [PubMed: 29223172]

Mahoney F, & Barthel D (1965). Functional evaluation: The Barthel Index. Maryland State Medical Journal, 14(2), 61–66.

Maxwell CJ, Amuah JE, Hogan DB, Cepoiu-Martin M, Gruneir A, Patten SB, Soo A, Le Clair K, Wilson K, Hagen B, Strain LA (2015). Elevated hospitalization risk of assisted living residents with dementia in Alberta, Canada. Journal of the american Medical Directors Association, 16(7), 568–577. [PubMed: 25717011]

Maxwell CJ, Soo A, Hogan DB, Wodchis WP, Gilbart E, Amuah J, Eliasziw M, Hagen B, Strain LA (2013). Predictors of nursin ghome placement from assisted living settings in Canada. Candian Journal on Aging, 32(4), 333–348.

McGregor MJ, McGrail KM, Abu-Laban RB, Ronald LA, Baumbusch J, Andrusiek D, Cox MB (2014). Emergency department visit rates and patterns in Canada's Vancouver Coastal Health aRegion. Canadian Journal on Aging, 33(2), 154–162. [PubMed: 24690211]

Musich S, Wang S, Slindee L, Saphire L, & Wicker E (2018). Characteristics of new-onset and chronic sleep medication users among older adults: A retrospective study of a us medigap plan population using propensity score matching. Drugs & Aging, 35(5), 467–476. [PubMed: 29651640]

Okeorji A (2017). The Impact of Nursing Staff Ratios on Falls Rates In Skilled Nursing Facilities. Doctoral dissertation, Walden University Available at: https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=4605&context=dissertations. Last accessed January, 2019.

Pearch NJ, Myers AM, & Blanchard RA (2007). Assessing subjective fall concerns in residential living seniors: Development of the activities-specific fall caution scale. Archives of Physical Medicine & Rehabilitation, 88(6), 724–731. [PubMed: 17532893]

Picorelli A, Hatton A, Gane E, & Smith M (2018). Balance performance in older adults with hip osteoarthritis: A systematic review. Gait & Posture, 65, 89–99. [PubMed: 30558954]

Piercy K, Troiano R, Ballard R, & et al. (2018). The Physical Activity Guidelines for Americans. JAMA, 320(19), 2020–2028. [PubMed: 30418471]

Renon-Guiteras A, thurmann P, Miralles R, KlaabenMielke R, Thiem U, Stephan A, et al. (2018). Potentially inappropriate medication among people with dementia in eight European countries. Age & Ageing, 47(1), 68–74. [PubMed: 28985257]

Resnick B, Galik E, & Boltz M (2013). Function Focused Care approaches: Progress and future possibilities. Journal of the American Medical Directors Association, 14(5), 313–318. [PubMed: 23246237]

Resnick B, Galik E, Gruber-Baldini A, & Zimmerman S (2011). Testing the impact of Function Focused Care in assisted living. Journal of the American Geriatrics Society, 59(12), 2233–2240. [PubMed: 22091790]

Resnick B, Gruber-Baldini A, Aboff-Petzer I, Galik B, Russ K, & Zimmerman S (2007). Reliability and validity of the evaluation to sign consent measure. The Gerontologist, 47(1), 69–77. [PubMed: 17327542]

Ryan-Atwood T, Hutchinson-Kern M, Ilomäki J, Dooley M, Poole S, Kirkpatrick C, et al. (2017). Medication use and fall-related hospital admissions from long-term care facilities: A hospital-based case-control study. Drugs & Aging, 34(8), 625–633. [PubMed: 28573553]

Schonfeld E, Tusler Meyer L, Becker A, Tate K, Moodabagil M, McSharry C, et al. (2018). Correlation of hearing loss and chronic falling among patients with dementia in 3 memory-care communities. Annals of Long Term Care, 26(2), 21–25.

Shannon K (2018). The care of older poeple with dementia in rural Australian hosptials-A case study. Australian Journal of Advanced Nursing, 36(1), 6–15.

Sotoudeh G, Mohammadi R, Mosallanezhad Z, Viitasara E, & Soares J (2018). The prevalence, circumstances and consequences of unintentional falls among elderly Iranians: A population study. Archives of Gerontology & Geriatrics, 79, 123–130. [PubMed: 30205318]

The Physical Activity Advisory Committee. (2018). 2018 Physical Activity Advisory Committee Report. Available at: https://health.gov/paguidelines/second-edition/report/pdf/02_A_Executive_Summary.pdf. Last access January, 2019.

Tricco A, Thomas S, Veroniki A, & et al. (2017). Comparisons for interventions for preventing falls in older adults: A systematic review and meta analysis. JAMA, 318(7), 1687–1699. [PubMed: 29114830]

Tuvemo J, Martin C, Anens E, Johansson A, & Hellström K (2018). Older adults' opinions on fall prevention in relation to physical activity level. Journal of Applied Gerontology, 37(1), 58–78. [PubMed: 26769824]

Urrunaga-Pastor D, Moncada-Mapelli E, Runzer-Colmenares F, Bailon-Valdez Z, Samper-Ternent R, Rodriguez-Mañas L, & Parodi J (2018). Factors associated with poor balance ability in older adults of nine high-altitude communities. Archives of Gerontology & Geriatrics, 77, 108–144. [PubMed: 29738899]

Williams J, Bachman M, Lyons M, Currie B, Brown L, Jones A, et al. (2018). Improving decisions about transport to the emergency department for assisted living residents who fall. Annals of Internal Medicine, 168(3), 179–186. [PubMed: 29230475]

Yang Y, van Schooten K, Sims-Gould J, McKay H, Feldman F, & Robinovitch S (2018). Sex differences in the circumstances leading to falls: Evidence from real-life falls captured on video in long-term care. Journal of the American Medical Directors Association, 19(2), 130–135. [PubMed: 28967601]

Zimmerman S, Greene A, Sloane P, Mitchell M, Giuliani C, Nyrop K, & Walsh E (2017). Prevention falls in assisted living: Results of a quality improvement pilot study. Geriatric Nursing, 38, 185–191. [PubMed: 27776786]

Table 1

Description of the Four Steps in FFC-AL-EIT

Steps	
Step 1 Environmental and Policy Assessments	Assessment of the environment and policies within the settings to optimize function and physical activity of residents.
Step 2 Education	Education of nursing staff, other members of the interdisciplinary team (e.g., social work, physical therapy), residents and families was done by the RNF and champion using previously established materials and adult learning techniques.
Step 3 Establishing FFC Goals	The RNF worked with the champion and nursing staff to complete Physical Capability Assessments and establish resident goals and integrate them into the individual's Service Plan.
Step 4 Mentoring and Motivating	The RNF worked with the champion to motivate residents to engage in function and physical activity and to motivate caregivers to provide function focused care to residents. This was done using social cognitive theory approaches including: (a) observing performance of caregivers and providing one-on-one mentoring to incorporate function focused care into routine care; (b) providing residents and caregivers with positive reinforcement for providing function focused care; (b) meeting with residents and caregivers to address their beliefs about physical activity and feelings and experiences associated with providing function focused care; (c) reinforcing benefits of function focused care and strengthening outcome expectations associated with function focused care for residents and caregivers; (d) highlighting role models (other caregivers who successfully provide function focused care); (e) eliminating unpleasant sensations associated with function focused care activities for residents and caregivers.

Table 2

Description of the Sample (N=381)

Variable	N (%)
Gender	
Male	113(30)
Female	268(70)
Race/Ethnicity	
Black	9(2)
White	370(97)
Asian	1(.5)
Undeclared	1(.5)
Sedative Hypnotics	
Yes	14(4)
No	367(96)
Opioids	
Yes	25(7)
No	356(93)
Antidepressants	
Yes	135(35)
No	246(65)
Anxiolytics	
Yes	241(6)
No	357(94)
Antipsychotics	
Yes	38(10)
No	343(90)
Falls at 4 months	
0	252 (73%)
1	51(15%)
2	21(6%)
3	14(4%)
4	5(1%)
6	1(.5%)
9	1(.5%)
Variable	**Mean (SD)**
Age	87.72 (7.46)
Comorbidities	5.00 (2.00)
Function	64.18(19.05)
Cognition	2.44(.75)
Moderate Physical Activity	44.29 (75.98)

Table 3

Logistic Regression Analyses for Predictive Models for Sustaining a Fall

	Unadjusted model				Adjusted model			
Predictors	**β**	**SE**	**Odds Ratio (*95% CI*)**	***P*-value**	**β**	**SE**	**Odds Ratio (*95% CI*)**	***P*-value**
Age	.05	.02	**1.05 (1.01 – 1.09)**	.01	0.04	.02	**1.05 (1.01 – 1.11)**	0.02
Cognitive Impairment	−.25	.17	.78 (.56 – 1.08)	.13	−0.24	.17	.78 (.56 – 1.09)	0.15
Function	−.01	.01	.99 (.98 – 1.01)	.75	−0.01	.01	.99 (.98 – 1.01)	0.61
Gender, male as reference	.36	.29	1.43 (.80 – 2.52)	.23	0.26	.29	1.43 (.81 – 2.53)	0.22
Comorbidities	.11	.07	1.12 (.98 – 1.27)	.09	0.11	.07	1.11 (.98 – 1.26)	0.1
Sedative Hypnotics	.53	.67	1.70 (.44 – 6.59)	.44	0.53	.67	1.69 (.45 – 6.31)	0.44
Anxiolytics	.94	.49	**2.60 (1.07– 6.37)**	.04	0.92	.49	2.50 (.97 – 6.47)	0.06
Antipsychotic Medications	−.11	.48	.90 (.35 – 2.34)	.83	−0.08	.48	.92 (.36 – 2.36)	0.86
Antidepressant Medications	.33	.28	1.39 (.80 – 2.43)	.24	0.37	.28	1.44 (.83 – 2.50)	0.19
Opioids	−1.19	.68	.30 (.09 – 1.06)	.06	−1.48	.68	**.23 (.06 – .82)**	0.02
Moderate Level Physical Activity	−.01	.002	**.99 (.99 – 1.00)**	.03	−0.01	.002	**.99 (.99 – 1.00)**	0.03
Exposed to FFC Intervention	.50	.27	1.64 (.96 – 2.79)	.07	0.46	.27	1.58 (.93 – 2.7)	0.09

Note: β: is the estimated coefficient in the logistic regression models;

The unadjusted model assessed the bivariate associations between each predictor and fall (yes/no);

The adjusted model included all predictors in the table;

The constant is: β =.98, SE = .12, Odds Ratio = .37 p = .01.