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Resident-to-Resident Mistreatment: Evaluation of a Staff Training Program in the Reduction of Falls and Injuries

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Abstract

Resident-to-resident elder mistreatment (R-REM) occurs frequently in long-term services and support settings. The purpose of the current study was to evaluate the effect of an R-REM training program for nursing and other front-line staff on resident falls and injuries in a cluster randomized trial of units within four nursing homes. Interview and observational data from a sample of 1201 residents (600 and 601 in the usual care and intervention groups, respectively) and staff were collected at baseline, 6, and 12 months. A generalized linear model was used to model the falls/injuries outcome. The net reduction in falls and injuries was 5%, translating to 10 saved events per year in an average-sized facility. Although the result did not reach statistical significance due to low power, the findings of fall prevention associated with implementing the intervention in long-term care facilities is clinically important.

Researchers have begun to address negative and aggressive interactions among residents in long-term services and support (LTSS) settings (Castle, 2012; Lachs et al., 2013; Pillemer et al., 2012; Ramirez et al., 2013; Shinoda-Tagawa et al., 2004; Teresi et al., 2014; Teresi et al., 2013a) because such aggression has been found to be extensive, and has the potential to cause physical harm to residents and psychological distress to both residents and staff (Rosen et al, 2008). Resident-to-resident elder mistreatment (R-REM), although not often studied, occurs with relatively high frequency. Epidemiological research (Lachs et al., 2016) has demonstrated that R-REM is prevalent, involving at least 20% of residents over a one-month period. Castle (2012) observed even higher rates using staff reports. Paradoxically, residents with higher physical functioning may be at greatest risk for involvement in R-REM (Lachs et al., 2016). The findings that ambulatory residents were more likely to be involved in R-REM translates into an increased probability of being in harm's way and subject to falls and injuries in an environment tolerant of R-REM. An extensive study on elder abuse in residential care facilities (Hawes & Kimbell, 2009) highlights the need for staff training and behavior management strategies to counter serious outcomes such as physical injury and emotional distress.

Falls and injuries:

Falls among older adults are a significant health concern, increasing the risk of mortality, morbidity, and disability. In 2015, falls among older adults cost Medicare alone over \$31 billion in direct medical costs (adjusted for inflation; Burns, Stevens, & Lee, 2016). An increasing number of people with dementia (Zimmerman, Sloane, & Reed, 2014) who are likely to have some degree of mobility limitation (Williams et al., 2005) translates into the need for fall prevention strategies specifically designed for this cognitively impaired population (Teri, Huda, Gibbons, Young, & van Leynseele, 2005).

R-REM is likely a contributing factor to falls and injuries in LTSS settings. Because R-REM is not always observed, it is not possible to link definitively these incidents to injurious outcomes. However, a program targeting R-REM, including removal of etiological factors contributing to R-REM and directly and indirectly to falls and injuries, such as crowding and obstacles obstructing egress (a putative contributing factor in R-REM) is posited to affect the overall rate of such instances. Interventions to enhance the delivery of health care for

chronically ill residents and improve the environment to lessen the risk of falls have been recommended (Wood-Nartker, Guerin, & Beuschel, 2014).

Staff training and behavior modification:

Frontline direct care staff have expressed need for further education and training for community and institutional elder abuse (Hagen & Sayers, 1995; Trevitt & Gallagher, 1996). Staff training and education have been demonstrated to be successful in ameliorating agitated behaviors manifested by individuals suffering from dementia (Jeon et al., 2012). Non-pharmacologic approaches to address abuse (Hirst, 2002) and disruptive behaviors in older adults with dementia have been documented, including behavioral interventions (Cohen-Mansfield, 2004). The antecedents, behaviors and consequences (ABC) approach has been identified as a practical applied framework for the development of appropriate interventions for disruptive behaviors (Douglas, James, & Ballard, 2004; Teri et al., 2005). This method supports the behavioral mapping technique, i.e., describing the behavior(s) (including the existing environmental factors) in a specific measurable way to establish the etiology and ramifications of the behavior(s). Interventions can then be developed, taking into account the detailed assessment of the behavior(s), as well as the individual's preferences. Working with the authors of some of these approaches and techniques, aspects of these programs were integrated into the R-REM intervention evaluated and presented herein.

Conceptual model of the longitudinal intervention outcome:

Teresi and colleagues (2016) developed a conceptual model for use in longitudinal research on elder abuse. This model was based on the results of a 2015 United States National Institutes of Health-sponsored conference on elder abuse prevention. Specifically, R-REM was considered a stressful event in the model predicting distal outcomes such as falls and injuries and affective well-being. Behavior disorder is causally related to R-REM and also acts as a mediator in the relationship between R-REM and the distal outcomes. The rationale for inclusion of falls and injuries as the primary outcome is that (a) they are linked directly and indirectly to R-REM because R-REM can result in falls and injuries, which may not always be observed; (b) reductions in environmental conditions inducing R-REM and leading to falls was a targeted element in the intervention; and (c) falls and injuries are associated with quality of life outcomes and societal costs.

Aims

The aim of the current study was to examine the longitudinal effects of a three-module program targeting front-line staff, particularly certified nursing assistants (CNAs) to implement best practices related to R-REM in LTSS settings on falls and injuries. It was hypothesized that the frequency of falls and injuries would decrease as a result of training.

Method

Design

The intervention with nursing staff was tested in nursing homes. A cluster randomized trial design with randomization of intervention units and matched comparison (usual care) units within facilities was implemented.

Randomization

Six nursing homes were selected randomly from among 21 nursing homes with 250 or more beds in two metropolitan New York regions. Five out of six facilities agreed to participate; however midway through the study and data collection, one facility experienced a change in administration, and was dropped from the analyses due to lack of ability to implement the intervention and collect the falls outcome data. Forty units (20 in the intervention and 20 in the usual care) were randomized. The mean (SD) cluster size was 30.03 (6.34) residents, with a range from 12–45. Units were randomly assigned to the intervention group, and the remainder to the usual care group. Case Mix Indices (CMI) and unit type data demonstrated group equivalence.

Description of the intervention

Staff on the intervention units received the training and implementation protocols, whereas individuals on the usual care units did not. The intervention targeted R-REM training of CNAs primarily, but was appropriate for other nursing and social work staff. The training modules were: 1) Recognition and Risk Factors, 2) Management, and 3) Implementation of Guidelines. The trainers were from backgrounds in nursing, nursing home administration, education, and social work. The content of the three sessions was described elsewhere (Ellis et al., 2014; Teresi et al., 2013a) and is presented only briefly below.

Recognizing R-REM: Module 1 provides evidence about personal and environmental risk factors such as crowding and obstacles. The putative role of cognitive impairment in R-REM is also discussed. Physical, psychological, and sexual R-REM is covered.

Management of R-REM: Module 2 presents: (1) a review of the previous session, 2) a film on management of elder mistreatment, and 3) the SEARCH (Support, Evaluate, Act, Report, Care Plan, Help to Avoid) approach to R-REM management (Ellis et al., 2014). A 25- minute film introduces three scenarios, illustrated by actors. Multidisciplinary experts are featured, and each skit is discussed in terms of staff interventions and outcomes that are more or less optimal.

Implementation of best practices related to R-REM: Module 3 is comprised of review material, and presentation of implementation methods and forms and reporting guidelines. Methods for completion of the intervention forms are illustrated using filmed vignettes for practice and confirmation of implementation skills. A review of practice sheets and implementation guidelines is also included.

Procedures

Intervention implementation—An extensive training manual was prepared to ensure fidelity. Senior research staff performed the training. Each session was scheduled twice for all the nursing shifts, including the night and weekend staff. Make-up sessions were held. All project staff involved in training and data collection were blinded regarding the intervention group status. Baseline interviews were collected prior to the trainers delivering the intervention.

Certified Nursing Assistant Sample: A total of 325 CNAs were trained on Module 1, 317 CNAs on Module 2, and 322 on Module 3 (implementation and use of the incident tracking sheets). The majority of CNA staff (about 14 staff members per unit, on average) were trained.

Data collection

Data for falls and injuries were collected via chart review and from Incident/Accident reports on an ongoing basis. Additionally, residents who were capable cognitively self-reported their falls during the past year. Resident and staff interviews for questionnaire data were performed by interviewers at three time points: baseline, 6, and 12 months using a computer assisted personal interview (CAPI) system. Data were collected with rolling enrolment; in-person and electronic medical record data were collected between July 2008 and July 2013. The study was approved by the Institutional Review Boards (IRB) at a university and the participating nursing homes that had an IRB.

Measures

Demographic variables from resident chart review included age, race, educational attainment, and length of stay in the facility. In addition, the following staff and resident measures were administered:

The Institutional Comprehensive Assessment and Referral Evaluation (INCARE; Golden, Teresi, & Gurland, 1984) was used to collect covariate data. Included are assessments of (a) arousal, (b) level of alertness, (c) simple commands, (d) cognitive functioning, (orientation, memory, calculation / attention), (e) range of motion and ambulation, (f) performance activities of daily living (PADL), (g) affect, and (h) behavior.

The PADL (Kuriansky & Gurland, 1976) is a 27-item scale that measures an individual's lack of ability to perform activities of daily living associated with eating, dressing and grooming, e.g., putting on, buttoning and unbuttoning a sweater, guiding a spoon to the mouth, and combing hair independently. The Cronbach's alpha estimate for this sample was 0.940 at baseline, 0.937 at 6- and 0.873 at 12-month follow-up. This scale was scored in the impaired direction.

Only one covariate from the INCARE was used in the analyses because the groups were balanced on all variables except two. The main cognitive screening measure used in this study was the Care Dementia Diagnostic Scale (CAREDIAG; Gurland, Wilder, Cross, Teresi, & Barrett, 1992; Teresi et al., 2000). The Cronbach's alpha estimate for the current

sample was 0.875 at baseline, 0.886 at 6- and 0.878 at 12-month follow-up. The scale was scored in the impaired direction. The ordinal alpha was 0.944; the McDonalds omega total was 0.945.

Falls/injuries outcome—Objective data concerning resident falls and injuries were collected. The data used for evaluation of the primary outcome and for R-REM reports include:

(a) The Minimum Data Set (MDS) /Patient Review Instrument (MDS/PRI; Morris et al., 1990): Data were collected for the three months prior to the start of the study and continuously until the end of data collection. The MDS is administered annually; a subset is collected quarterly and when there is a significant change. All records approximately three months (range 1–3) prior to the baseline interview were collected for each individual. Then each subsequent full, annual, quarterly or change in status MDS was collected up to and including three months after the close of data collection at the facility. There are four items related to falls and to hip fractures during the previous 30 and 180 day periods in the MDS.

(b) Accident and Incident Reports: The New York State Department of Health (DOH) mandates accident and incident reports. Federal regulations require immediate reporting of alleged violations of abuse, mistreatment, and neglect, including injuries of unknown origin, to the facility administrator and in accordance with state law, to the DOH. An incident/accident report documents the circumstances surrounding falls, fractures, lacerations and other accidents.

(c) Resident Chart Review: Nursing, social service, and activities notes, as well as care planning conference reports were reviewed for occurrences of R-REM, falls, and injuries. A review of residents' charts was performed for the period six months prior to baseline through the end of data collection.

This multi-source approach yielded the best classification of the incidence of falls, fractures, and injuries. Another exploratory source of falls data was from the residents who were capable cognitively of self-report. They reported falls over the past year. These data were used in exploratory analyses of the relationship between falls and R-REM; given that it was posited that residents would be able to report more unobserved falls related to R-REM.

Statistical Analysis

Preliminary analyses were performed to determine whether the groups were balanced. Two-tailed tests of significance were performed. Binomial tests were conducted on dichotomous variables, Poisson tests on non-binomial (e.g., count) data, and t-tests on ordinal data, adjusting standard errors for clustered data within facilities; *p* values are reported because the design did not permit randomization at the level of the individual. Group differences in total scores were examined using a linear mixed (fixed and random effects) model for effect estimation. Clustering within units was modeled as a random effect.

A generalized linear model was performed using SAS Proc Glimmix Version 9.4 with an autoregressive covariance structure. Some imbalance in groups was observed for cognition

and performance ADL. Because of collinearity with the performance ADL measures only the cognition measure was included in the analyses. The general model is: $\eta_{ij} = \log(\pi_{ij}/(1 - \pi_{ij})) = \alpha + \mu_i + \mu_j + \beta_c * Cdiagp + \beta_i * time$, where η is the logit link, π_{ij} is the expected probability of a fall for a subject of group i and unit j , α is the intercept, μ_i is the fixed effect for group, μ_j is the random effect of unit with mean=0, β_c is the slope of the cognitive measure (Cdiagp; pro-rated for missing data and treated as time varying), and β_i is the slope of time for group i (see Aitkin, Anderson, Francis & Hinde, 1989; Lawless, 1987). The expected probability of a fall/injury for subjects of group i and unit j is: $\pi_{ij} = \frac{e^{\eta_{ij}}}{1 + e^{\eta_{ij}}}$.

Results

Facility sample

Agreement to participate was obtained from five of the six facilities, yielding a facility response rate of 83%. However, one facility did not complete study implementation and longitudinal falls data were not collected; thus the final response rate was 67%. The final power calculations showed that four facilities would be sufficient to yield the requisite sample sizes to detect moderate but not small effects. (See the Consort Diagram in Figure 1.)

The sample represented 19% of large facilities (250+ beds) in the regions. Comparison data were obtained from the Medicare website of the U.S. Department of Health and Human Services. Quality measures, inspection reports and staffing data for the sample were compared to those from New York State and nationally. The review showed that generalizability was most likely beyond local or regional.

For the four facilities, including all residents who did not participate regardless of the reason in the denominator, the overall response rate was 81.2% (1201/1479); 81.4% (600/737) in the usual care group and 81.0% (601/742) in the intervention group.

The final analytic sample was 1201, with 601 residents in the intervention and 600 in the usual care group. Missing data were observed over time for some measures requiring resident and/ or staff interviews, in part due to illness, cognitive decline or availability. However, little missing data were observed longitudinally for the primary outcome, falls and injuries because data were collected from accident/incident reports, chart data, and the MDS.

There were no significant demographic differences between the usual care and intervention arms. (See Table 1.) At baseline, both groups were primarily female, White, and widowed. Intervention and usual care group residents were of equivalent age, mean= 85.2 (± 8.9 years) and mean= 85.7 (± 8.8 years), respectively.

Equivalence was observed for the majority of baseline covariates. (See Table 1). However, the intervention group evidenced cognitive (Care Diagnostic scale, mean=8.55, s.d.=4.62) and functional impairment levels (PADL mean=2.90, s.d.=5.44) of a slightly greater magnitude compared to the usual care group (mean=7.15, s.d.=4.51; mean=1.62, s.d.=3.59 respectively). Because of collinearity, only the cognitive covariate was included in the multivariate analyses described. Because of missing data on the falls/injuries variable for 49

subjects in the usual care and 48 in the intervention groups, a reduced sample was used in the analyses (n=551 usual care and n=553 intervention.) The groups were equivalent at baseline.

Relationship of R-REM to falls:

The range of R-REM was from 10.4% to 31.2% for the sample of four facilities. The range of falls across facilities using the formally reported rates was from 18.2 to 31.1%. The R-REM rates were higher when self-reported than formally reported because of the longer time-frame for the self-reports and the possibility of reporting falls not documented or observed formally. Among those who could self-report (n=893), 41.7% of those involved in R-REM vs. 33.6% of those not involved in R-REM experienced a fall in the past two weeks. Examining only those formally reported using minimum data set data, smaller differences in the number of falls were observed. In the high R-REM rate facilities, the fall rate was 21.9% vs. 18.4% in the low R-REM rate facilities.

Effect of the intervention on falls:

Although the result was not significant ($p=0.235$), it was in the expected direction, with fewer falls observed in the intervention group over time and post training. It is possible to estimate the number of falls saved. The observed baseline rate of falls in the usual care group was 0.240 and 0.244 in the intervention group; the respective rates at follow-up one year later were: 0.235 and 0.180. The model-based net reduction in falls was estimated at 5%. Thus, for the average 200 bed nursing home the number of saved falls in one year was estimated at 10.1. (See Table 2.)

Power calculations show that this effect size would be detectable (significant) only for very large sample sizes. For power of 80%, the sample size required to detect a net endpoint difference of 5% under different scenarios regarding reliability of the falls data and clustering range from 1094 to 1678 residents per group. As shown, the sample size was underpowered to detect effect sizes of this magnitude. However, a savings of 10 falls per year is a clinically important effect associated with the intervention. This result is close to the effect size which reflected significant fall reduction in a similar adequately powered study of a cluster randomized trial of a training intervention to reduce falls (Teresi et al., 2013b).

Sensitivity analyses were performed including all subjects as randomized who had at least one fall datum, ignoring the covariate adjustment (n=553 intervention; n=551 usual care). The estimates were almost identical ($\beta = -0.0220$; $p=0.264$). Across various sensitivity analyses, the estimates were similar, with a 1.5% to 2% reduction in falls in the usual care group as contrasted with a 5% to 7% reduction in the intervention group. The net reduction was between 5% and 6% and the savings in falls per year between 9.4 and 11.

Discussion

Studies have evaluated the impact of education programs addressing aggressive behaviors in nursing homes. Generally, the focus has been on resident to staff aggression (Chrzescijanski, Moyle, & Creedy, 2007; Hagen & Sayers, 1995; Narevic et al., 2011), although in one study

(Pillemer & Hudson, 1993), both resident to staff and staff to resident aggression were examined. Overall, there was a decrease in the number of aggressive incidents.

The risk factors and explanatory mechanisms for falls among nursing home residents often include a combination of individual- and environmental-level elements. The conceptual model used as the framework to guide this intervention evaluation study places falls as a distal outcome resulting from R-REM. Findings supported the hypothesis of a reduction in falls/injuries associated with the intervention group status. CNAs' training on recognition, reporting, and management of resident-to-resident mistreatment was a contributing factor in falls reduction. It is estimated that about 10 falls were saved in larger long-term care facilities as a result of the intervention, a finding that is deemed clinically significant given the impact of falls on morbidity and mortality among the institutionalized elderly (Deandreaa et al, 2013). The reduction of falls and falls-related injuries is fundamental for resident safety and care quality in LTSS settings.

Plausible consequences of falls are multiple, including physical and psychological decline, and mortality. Fractures, lacerations, abrasions, and other injuries require on site attention and/or hospitalization. Similarly, falls (with or without consequential injury) can decrease the resident's quality of life as well as functional ability. The fear of R-REM related falls and injuries may deter individuals from participation in social and leisure activities, increasing the likelihood for isolation, dependency, and physical frailty (Jørstad, Hauer, Becker, Lamb, & ProFaNE Group, 2005; Suzuki, Ohyama, Yamada, & Kanamori, 2002). Thus, an R-REM intervention aimed at reducing falls and injuries may confer potential safety and quality-of-life benefits to residents, in addition to positive financial implications (in terms of cost-savings) for long-term care institutions.

A cluster randomized trial in residential care facilities provided evidence that an interdisciplinary, multi-level (resident, staff, and environment) prevention program that included nursing staff training reduced the number of residents who fell and the total number of falls (Jensen, Lundin-Olsson, Nyberg, & Gustafson, 2002). Similarly, the findings of the present cluster randomized trial support the hypothesis that falls associated with R-REM can be prevented with staff training. Nursing homes are required to provide 12 hours of training per year to nursing staff, and evidence-based training is critical to effecting practice changes (Barba & Fay, 2009; McConnell et al, 2009). It is recommended that CNA training on recognition, reporting, and management of resident-to-resident mistreatment be integrated into the training curricula provided by long-term care facilities. It is thus advocated that all nursing personnel be aware of and familiar with the same training. Registered nurses are responsible for leadership in the LTSS practice setting and their knowledge and support of R-REM assessment as a falls prevention intervention is essential for successful implementation and outcomes. In most settings, the registered nurse will serve as the educator for the facility.

As identified in this study, training in R-REM can result in a decrease in the number of falls by residents in nursing homes. The R-REM training results in nurses and care staff having the skills to prevent and knowledge of behaviors that can lead to falls. Many physical behaviors of aggression, such as grabbing, kicking, hitting, and pushing are examples of R-

REM that could lead to falls. In this study a relationship between R-REM and falls was observed with higher fall rates reported among residents who were also involved in R-REM compared with those who were not involved in R-REM. When nursing and care staff are aware of these behaviors and the possible outcomes, they are able to develop care plans to help avoid occurrences of such incidents.

Strengths and limitations

A methodological strength in the assessment of falls and injuries in long-term care was using a multi-source, triangulation approach. This multi-source approach yielded the best classification of the outcome; however, the possibility of under-reporting still exists. In that context, the findings reported in the study may represent a conservative estimation.

The study has several limitations. Even with random assignment, it is not possible to control for unmeasured factors in the intervention group that may have led in part to the reduction in falls, such as cultural or environmental factors. Because of low variation in the falls/injuries and R-REM rates in the small sample of facilities, it was not possible to examine definitively the relationship of R-REM to falls. However, preliminary evidence examining a self-reported falls outcome and classification of facilities into high and low fall rates based on formal reporting did show a relationship between R-REM and falls, with more falls associated with R-REM. Additionally, because this was a randomized, controlled trial, the main study hypothesis examined here was whether the training program had an impact on falls.

It is also not possible to pinpoint the underlying mechanisms by which fall reduction was achieved through the intervention. Mechanisms may include: enhanced staff vigilance, environmental modifications, and individualized behavior interventions taught to staff. It could be that training: (a) increased overall sensitivity and vigilance by staff related to injury prevention; (b) resulted in removal of R-REM inducing factors such as obstacles preventing egress, often observed to result in R-REM; (c) resulted in individual behavioral interventions that mitigated behaviors associated with falls; (d) reduced falls related directly to R-REM because many events are unobserved; or (e) achieved fall reduction through a combination of factors.

Future research should examine ways to ultimately prevent R-REM and reduce factors leading to R-REM such as obstacles, crowding and small space that prevents egress and thus indirectly affects fall and injury rates. Additionally, future research should examine high and low R-REM facilities in terms of falls and injuries.

We powered the study to detect moderate effect sizes and the study was under-powered to obtain statistical significance for the smaller effect sizes observed. However, an important point is that five percent is clinically meaningful and yields similar effect sizes as those observed in a prior training intervention study targeting falls. In that study (Teresi et al., 2013b), it was estimated that 12 falls would be prevented annually in an average nursing home, with significant results due to the much larger sample sizes (2,000 to 3,000 per group).

Conclusion

This study examined the impact of training on frontline staff as a way to anticipate and intervene appropriately in R-REM events that ultimately reduces episodes of falls in LTSS settings. A reduction of approximately 10 falls per year was estimated in an average size (200 bed) facility exposed to the intervention compared with facilities not exposed. Evidence of such an effect supports implementation of the R-REM program in LTSS settings. Given the dramatic, negative outcomes that can result from falls, as well as the falls reduction goals most facilities have, this training holds great promise. There is likely an application of this same approach to older persons in assisted living and acute care settings where R-REM may also occur.

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Relevance to clinical practice:

Attention should be paid to R-REM, which potentially endangers long-term care residents. Identification of potential incidents that can lead to falls can add to the reduction of the number of falls. Training of staff in the recognition of R-REM is important to improve the identification and management of R-REM and reduce consequences for older people living in LTSS settings. Although it is important to recognize the caveats associated with this study a training program aimed at R-REM recognition and treatment modalities is associated with a fall/injury reduction. To the authors' knowledge this is the first intervention study targeting R-REM and the first to address front-line nursing assistant staff. Dissemination of this program could have a positive impact on: (a) protecting vulnerable persons, (b) reducing falls and injuries, (c) enhancing staff recognition and knowledge about how to intervene in resident-to-resident altercations, and (d) ultimately reducing costs of care through fall and injury prevention.

Figure 1.
Consort Diagram of Recruitment and Analyses of Facilities and Residents

Table 1:

Baseline demographic characteristics and scale scores by intervention group (n = 1,201)

Characteristic	n (%)						p Value
	Usual care (n=600)		Intervention (n=601)		Total (n=1,201)		
Female	444	(74)	443	(73.7)	887	(73.9)	0.909
Race/Ethnicity							
Black, non-Hispanic	87	14.5	106	17.6	193	16.1	0.103
Hispanic	92	15.3	93	15.5	188	15.4	0.736
Marital Status							
Married	77	12.8	72	12.0	149	12.4	0.588
Never married	114	19.0	106	17.6	220	18.3	0.538
	Mean (SD)						
Age (years)	85.7 (8.8)		85.2 (8.9)		85.4 (8.85)		0.385
Education (years)	12.09 (3.85)		12.34 (4.05)		12.21 (3.95)		0.317
Resident measures (n)							
Range of Motion [488, 401, 889]	6.72(7.19)		6.99(7.22)		6.84(7.20)		0.574
Feeling Tone Questionnaire Total [521, 466, 987]	54.70(11.26)		54.68(12.38)		54.69(11.79)		0.978
Care Dementia Diagnostic Scale [566, 546, 1,112]	7.15(4.51)		8.55(4.62)		7.84(4.61)		0.001
PADL Scale Total [368, 315, 683]	1.62(3.59)		2.90(5.44)		2.21(4.58)		0.001
Extended Depression Scale [347, 225, 572]	6.52(5.72)		7.19(6.21)		6.78(5.92)		0.186
Fear of Falling Scale (7-item) [335, 225, 360]	0.90(1.60)		0.96(1.58)		0.92(1.59)		0.662
Prorated score over time							
Observed affect [599, 597, 1,196]	6.71(2.48)		6.84(2.55)		6.78(2.51)		0.378
Observed behavior [599, 597, 1,196]	5.40(2.28)		5.22(2.24)		5.31(2.26)		0.174
Observed total [599, 597, 1,196]	9.41(3.30)		9.23(3.19)		9.32(3.25)		0.349
Staff informant measures							
Disturbing Behaviors [594, 586, 1,180]	9.74(8.15)		10.11(8.22)		9.92(8.18)		0.435
Mood – all [590, 584, 1,174]	0.80(5.73)		0.78(5.55)		0.79(5.64)		0.962
Observation Schedule PADL – assistance [576, 577, 1,153]	11.39(7.72)		14.22(6.84)		12.81(7.43)		<0.001

Note: PADL = performance activities of daily living

Range of motion: 0-21; higher score indicates greater impairment

Feeling Tone Questionnaire total: 25-96; higher score indicates greater impairment

Care Dementia Diagnostic Scale: 0-17; higher score indicates greater cognitive impairment

PADL scales total: 0-29; higher score indicates greater impairment

Extended Depression Scale: 0-29; higher score indicates greater depression

Fear of Falling Scale (7-item): 0-7; higher score indicates greater fear of falling

Observed affect: 0-18; higher score indicates greater observed affective disorder

Observed behavior: 0-29; higher score indicates greater observed behavior disorder

Observed affect and behavior total: 3-44; higher score indicates greater disorder

Disturbing behaviors: 0-47; higher score indicates greater behavior disorder

Mood—all: standardized sum from -9-22; higher score indicates greater mood disorder

Observation schedule PADL—assistance: 0-20; higher score indicates greater need for assistance

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Table 2.

Results of analyses of the outcome: Falls and injuries

	Falls Model (n = 1,104; usual care = 551; intervention = 553)		
	Estimate	Standard Error	p-value
Intercept	-1.2057	0.1657	<0.0001
Care Dementia Diagnostic Scale	0.00252	0.01249	0.8401
Randomization Group	0.1559	0.1921	0.4172
Time	-0.00479	0.01405	0.7332
Time by Randomization Group	-0.02369	0.01993	0.2346

Falls/injuries is a dichotomous variable with one indicating “yes” (resident fell/and or had injury) and zero indicating “no”. Logistic regression analyses assuming a logit link and binomial distribution, a first order auto-regressive covariance structure and an adjustment for clustering within unit was performed. Up to three waves of data were included in these analyses, using MDS/Incident/Accident and Chart assessments closest to baseline, six month follow-up, and twelve month follow-up. 49 cases in the usual care and 48 in the intervention group were missing falls data.