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Pain, Delirium and Physical Function in Skilled Nursing Home Patients with Dementia

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Abstract

Objective—Skilled Nursing Facilities (SNFs) are major sites of post-acute care for patients with dementia. A recent Office of the Inspector General report indicated that outcomes in SNFs are sub-optimal due to poor-quality treatment, including the failure to provide needed care. Pain is frequently un-recognized and un-treated in patients with dementia. The aim of this exploratory study was to examine the effect daily pain has on delirium and physical function in patients with dementia in SNFs. The association of daily pain with discharge disposition was also examined.

Design—Secondary analysis of data from an on-going randomized clinical trial.

Setting—Eight SNFs located in central and northeast Pennsylvania.

Participants—One hundred and three SNF patients with adjudicated dementia and delirium diagnoses and a mean age of 86 (± 6.8) years; most were female (66%) and Caucasian (98%).

Measurements—Measures of pain (Pain Assessment in Advanced Dementia), delirium (Confusion Assessment Method), and physical function (Barthel Index) were taken daily for 30 days or until discharge.

Results—On days when participants experienced greater than their average level of pain they also experienced more delirium symptoms ($p < .001$) and lower physical function ($p < .001$). Participants with higher levels of average daily pain were more likely to die (OR = 6.306, 95% CI:

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1.914–20.771, $p = .003$) or be placed in a nursing home (OR= 4.77, 95% CI:1.7–13.2, $p=.003$) compared to returning to the community at 3-month follow-up.

Conclusion—Greater attention to pain in patients with dementia may be a potential solution to some of the quality problems and high costs of care in SNFs

Keywords

pain; delirium; physical function; Skilled Nursing Facilities

Introduction

Post-acute care provided in Skilled Nursing Facilities (SNFs) is designed to return patients to their highest level of functioning possible and reduce the high cost of disability following hospitalization. Despite Medicare expenditures that are second only to inpatient hospital care, a recent Office of the Inspector General (OIG) report indicated that outcomes in SNFs are often suboptimal due to poor-quality treatment, including the failure to provide needed care.¹ The report indicated that nearly one third of Medicare beneficiaries who went to SNFs in 2011 for 35 days or less experienced harm events that were largely preventable.

Pain is common in older adults² and in dementia, where 50% experience regular pain.³ Inadequate pain management can thwart rehabilitation efforts and dramatically increase costs by its harmful effects on mobility, cognition, healing and mood.⁴ In older adults with dementia, pain is frequently unrecognized and under-treated due to a number of complex factors, including inability of patients to verbally communicate the presence of pain⁵ and a lack of clear guidance for health care providers on the best approach to treatment in different types of dementia.³ Inappropriate pain medication was a major source of harm identified in the OIG report. Although not singled out in the OIG report, *inadequate* pain management is likely to harm individuals with dementia in SNFs, and it may contribute to their 40% increased risk for re-hospitalization as reported in the literature.⁶

Patients with dementia benefit from post-acute care and can experience significant functional improvements over their admission status.⁷ Less is known about how to optimize rehabilitation efforts in these individuals, although pain would be a logical target because when un-treated it sets in motion a cascade of negative outcomes. For example, surgical patients who reported greater pain at rest were found to be at higher risk for the development of delirium after controlling for pre-operative delirium risk factors.⁸ Dementia is the greatest risk factor for the development of delirium during hospitalization⁹ and a substantial proportion of these patients are discharged to SNFs with unresolved delirium.¹⁰ In a prospective cohort study, delirium superimposed on dementia on admission to these settings was a strong predictor of functional dependence, specifically walking recovery, at discharge and 1-year follow-up.¹¹ There is also a large body of literature that links pain to impaired physical function.¹² Worsening functional status during rehabilitation is an important risk factor for 30-day unplanned re-hospitalizations,¹³ the rate of which is over 23% in SNFs.¹⁴

Pain management for individuals with dementia has received research attention, but there are little data to describe the impact of pain on daily function in the large number of those

who receive post-acute care services in SNFs. Most transitional care research has excluded individuals with dementia. Thus, the aim of this exploratory study was to examine the effect daily pain has on delirium and physical function in patients with dementia who receive rehabilitation services in SNFs. The association of daily pain to discharge disposition was also examined. Because pain is so variable from individual to individual we were interested in how pain on a given day is related to delirium symptoms and physical function on that same day, and we conducted our analyses to capture this within-person perspective.

Methods

Data from an ongoing randomized clinical trial were used to address the aim of the study ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01267682) identifier: NCT01267682). The investigators in that trial are testing the efficacy of cognitively stimulating activities for resolving delirium in persons with dementia during post-acute care. The long-term goal of this work is to maximize rehabilitation so community-dwelling older adults can return to their homes following an acute care episode. The protocol received Institutional Review Board approval and has been published.¹⁵

Setting and Sample

Participants are recruited and enrolled at the time of admission to one of eight SNFs located in central and northeast Pennsylvania. The sites were selected to be reflective of SNFs in the US: they are community-based and include a mix of profit and non-profit facilities.

Eligible participants are those who are 65 years of age or older, community-dwelling prior to admission, have a knowledgeable informant, and have both dementia and delirium on admission to the SNF. The diagnosis of dementia is based on a score of three or greater on the Modified Blessed Dementia Rating Scale (MBDRS)¹⁶; and a Clinical Dementia Rating (CDR)¹⁷ score ranging from 0.5 to 2.0, indicating mild to moderate stage dementia. The presence of delirium is established by screening potential participants using two instruments: 1) the Mini-Mental State Exam (MMSE),¹⁸ a 30-item cognitive screen, and 2) the Confusion Assessment Method (CAM),¹⁹ a standardized diagnostic algorithm for delirium. All dementia and delirium diagnoses are adjudicated by a panel of three experts in dementia: a neuropsychologist, a neurologist, and a geriatrician. Exclusion criteria include: having any neurological or neurosurgical disease associated with cognitive impairment other than dementia, including Parkinson's disease with Lewy bodies, Huntington's disease, normal pressure hydrocephalus, seizure disorder, subdural hematoma, head trauma, or known structural brain abnormalities; nonverbal; having a life expectancy of six months or less; acute major depression or psychosis; and severe hearing and vision impairment.

Following written consent, participants are randomly assigned to one of two conditions: cognitive stimulation (intervention) or usual care (control). For this study only participants assigned to usual care were included. These 103 participants had a mean age of 86 (± 6.8) years, a Charlson Co-morbidity Index²⁰ score of 2.79 (± 1.6), and a CDR score of 1.21 (± 0.6); 66% were female and 98% were Caucasian.

Procedure

Participants are assessed by trained research staff blind to treatment condition. Observational measures of pain, delirium and physical function using the Pain Assessment in Advanced Dementia (PAIN-AD),²¹ CAM, and Barthel Index (BI),²² respectively, are taken daily for 30 days or until discharge. Three months following SNF admission a phone interview with the responsible party is conducted to determine the participant's discharge disposition.

Measures

The CAM has four features: 1) acute onset and fluctuating course, 2) inattention, 3) disorganized thinking, and 4) altered level of consciousness. Scores range from 0–4. The CAM has been validated in persons with dementia, but because of the risk of feature overlap with dementia only subjects with full (three or more features) or subsyndromal delirium (two features) are admitted to the study. The CAM has sensitivity between 94% and 100% and specificity between 90% and 95%.¹⁹

The BI is a commonly used ordinal scale for assessing activities of daily living in patients receiving inpatient rehabilitation. The BI has ten items (seven for self-care and three for mobility) that are scored in steps of five points with a total score range of zero (totally dependent) to 100 (fully independent). The BI is a reliable indicator of functional ability in older adults when administered by face-to-face interview (ICC 0.89) and on testing by different observers (ICC 0.95–0.97).²²

The PAIN-AD is an observational scale of five items (breathing, vocalization, facial expression, body language, and consolability). An observational rather than a verbal scale was used for greater reliability because delirium can interfere with verbal communication. PAIN-AD is scored from 0–10 and has an internal consistency reliability of 0.50–0.65 and interrater reliability of 0.82–0.97. A score of 1–3 indicates mild pain; 4–7 moderate pain; and 7–10 severe pain.²¹

Discharge disposition was determined in a 3-month follow-up phone interview with the responsible party and was classified as: home or assisted living (community), nursing home, or death.

Analytic strategy

Data in the current study were nested (days in persons and persons in facilities) and analyzed using multilevel models (MLMs). MLM (SAS proc mixed) allows for the examination of within-person relationships, that is, how pain on a given day is related to delirium symptoms on that same day within an individual.²³ Analysis focused on the two-level models and a categorical variable representing facility was included as a covariate to control for any variability associated with differences across facilities.

Delirium and physical function scores were modeled using the following equations:

$$Y_{ij} = b_{0j} + b_{1j} \text{Pain}_{ij} + e_{ij} \quad \text{Level 1:}$$

$$b_{0j} = \beta_{00} + \beta_{01}\text{pain}_{.j} + u_{0j} \quad b_{1j} = \beta_{10} + u_{1j} \quad \text{Level 2:}$$

At level 1, b_{0j} is the outcome for individual j on day i . The slope relating daily pain to the outcome is represented by b_{1j} . β_{00} and β_{10} are the average within-person effects for the intercept and slope. Each of these effects was allowed to vary across individuals reflected in the parameters u_{0j} and u_{1j} . Pain was within-person centered and is interpreted as changes in the outcome on days when a given individual was higher or lower than their average. The person-mean was included in the model to account for individual differences in level of pain. Covariates were entered at level 2: age, gender, ethnicity, marital status, CDR, Charlson Co-morbidity Index score, and facility. Age, CDR and Charlson were grand-mean centered. Pseudo- R^2 was calculated as a measure of effect size via the methods suggested by Singer and Willett²⁴ and represents the amount of variance in the outcomes (delirium and physical function) accounted for by the within-person predictor of interest (pain). Multinomial logistic regression, with returning to the community (home or assisted living) as the reference, was used to determine whether average daily pain predicted discharge disposition three months following SNF admission.

Results

Overall, participants experienced pain on 38.4% of days, and across all observations it was rated as none (61.6%), mild (29.43%), moderate (8.46%) or severe (0.53%). Delirium symptoms were evident on 46.9% of days. Functioning scores ranged from 0 to 100 with an average of 44.42 ($SD = 23.3$). Table 1 lists the means and standard deviations across all observations for the major study variables.

The final models for daily pain predicting delirium symptoms and physical function scores are presented in Table 2. On days when a participant experienced more pain than their average, they also experienced more delirium symptoms. The pseudo- R^2 was .191 suggesting that daily pain accounted for 19% of the day-to-day variation in delirium scores. Average pain also significantly predicted delirium symptoms; on average, individuals experiencing more pain also experienced more delirium symptoms. Of the covariates, higher CDR scores predicted greater delirium symptoms. No other covariates were significant.

Using a chi-square difference test, we also examined whether there were significant individual differences in the relationship between daily pain and delirium symptoms. This test was significant ($\chi^2_{diff}(1) = 83.7, p < .0001$) indicating that allowing the relationship to vary across individuals improved model fit. In the current sample, 88% of individuals had positive slopes consistent with the average within-person effect of daily pain on delirium symptoms.

Results for daily pain predicting physical function scores appear in the right hand side of Table 2. On days when an individual experienced more pain, they had poorer physical function. The Pseudo- R^2 was .078, suggesting that daily pain accounted for approximately 8% of the day-to-day variation in physical function scores. At level 2, both higher average pain and older age were significantly associated with poorer physical function. Similar to the model predicting delirium symptoms, we tested for individual differences in the daily pain-

functioning relationship. This test was significant ($\chi^2_{diff}(1) = 52.2, p < .0001$); 73% of the current sample had a slope consistent with the average within-person effect.

Finally, we examined the discharge disposition of the 89 participants who completed their 3-month follow-up phone interview. Participants with higher values for average daily pain were more likely to be placed in a nursing home (OR = 4.77, 95% CI: 1.729–13.163, Wald $\chi^2 = 9.10, p = .003$) or to have died (OR = 6.306, 95% CI: 1.914–20.771, Wald $\chi^2 = 9.17, p = .003$) than to return to the community (home or assisted living).

Discussion

This is one of the first studies to report on the effect of pain on patients with dementia in SNFs. We acknowledge that the study has several methodological limitations. Our data were taken from an ongoing clinical trial and are cross-sectional, thus we are unable to establish causal relationships among the variables of interest. Further, some of our estimates were small, so there are likely unmeasured variables in our models that could explain greater variance in the delirium and physical functional outcomes, such as acuity of illness. Nonetheless, our within-person analysis found that on days when participants experienced greater than their average level of pain they also experienced more delirium symptoms and lower physical function. As previously reported in the literature, we also found that greater dementia severity predicted greater delirium severity²⁵ and greater age predicted lower physical function.²⁶ Participants with greater daily pain were more likely to have died or to be discharged to a nursing home than return to the community in the three month period following SNF admission.

SNFs are sites of transitional care where the goal is to return the person to the community rather than to an institution. National dementia strategies call for improvement in transitions for people with dementia, but there are few existing strategies that facilitate transitions during post-acute care.²⁷ Pain is common in SNFs but under-recognized in patients with dementia.⁵ This gap in transitional care is critically important to address given the association of pain to both delirium and functional dependency and subsequent risk for death or permanent institutionalization. Patients with dementia are vulnerable to insults that may be inconsequential to cognitively intact patients because of their more limited cognitive reserve.²⁸ Based on our results, staff need to recognize the presence of even mild increases in daily pain in patients with dementia, and take steps to reduce the adverse effects on delirium and physical function as well as eventual discharge disposition following post-acute care. Pain can be prevented or better managed and it has been touted as the fifth vital sign²⁹. As an initial step, staff should partner with families who can play a critical role in the recognition of pain and other symptoms by providing a description of their family member's normal baseline.³⁰ Because non-professional staff comprise the majority of the nursing home workforce, simple and accurate observational tools for the assessment and recognition of pain should be used on each shift. Examples of tools that have been developed for direct care staff and that can be easily integrated into the work flow of busy staff include the PAIN-AD³¹ or the NOPPAIN³². For professional care providers, clinical practice guidelines for pain management are available through the American Medical Directors Association (<http://www.amda.com/tools/guidelines>). These guidelines include steps to overcome

barriers to effective pain management. Given the growing number of older adults with dementia who require post-acute care following hospitalization,³³ this study highlights the need to elevate the attention to and resources given to their pain, delirium and physical function in the SNF setting as a potential solution to some of the quality problems and high costs of care in these settings.

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- * We modeled the effect of pain on delirium and physical function in skilled patients.
- * Greater than average level of pain predicted more delirium symptoms ($p < .001$).
- * Greater than average level of pain predicted lower physical function ($p < .001$).
- * Discharge disposition (community vs. other) was associated with average daily pain.

Table 1Means (\pm SD) For Major Study Variables Across All Observations

	Mean	SD	Min	Max
Barthel Index	44.42	23.26	0.00	100.00
CAM	0.84	0.86	0.00	3.86
PAIN-AD	0.86	1.01	0.00	4.57

Note. Barthel Index- range: 0–100; Confusion Assessment Method (CAM)- range: 0–4; Pain Assessment in Advanced Dementia (PAIN-AD)- range: 0–10

Table 2

Daily pain (PAIN-AD) predicting daily delirium (CAM) and daily functioning (BI) scores

	Delirium scores		Functioning scores	
	Estimate	SE	Estimate	SE
Fixed Effects				
Daily pain	0.2286	0.03*	-0.9331	0.26*
Average pain	0.3679	0.07*	-8.3788	2.12*
Age	0.0005	0.01	-0.8212	0.32*
Gender	-0.1660	0.17	4.0856	4.92
Ethnicity	-0.1603	0.53	8.0658	15.68
Marital status	0.3159	0.27	5.2793	3.59
CDR score	0.4787	0.13*	-4.7762	3.91
Charlson score	-0.0562	0.05	0.8348	1.40
Facility	-0.0169	0.03	-1.3385	0.87
Variance Components				
Between Person				
Intercept	0.4373	0.07*	397.54	62.02*
Daily Pain	0.0377	0.01*	2.3843	0.76*
Within Person				
Residual	0.4698	0.02*	58.4623	1.89*

Note.

* $p < .001$; PAIN-AD= Pain Assessment in Advanced Dementia ; CAM= Confusion Assessment Method; BI= Barthel Index; CDR = Clinical dementia rating