



Outstanding Research Paper

Injurious Falls, Hospitalizations, and Emergency Department Visits Among Residential Care Residents With Cognitive Impairment: Adverse Outcomes in Dementia Special Care Units (DSCU) Versus Non-DSCU Settings

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ABSTRACT

Objectives: Residential care communities (RCCs) serve increasingly more cognitively impaired individuals who require specialized care. This study examined if residing in dementia special care units (DSCUs) is associated with fewer injurious falls, hospitalizations, and emergency department visits among older, cognitively impaired RCC residents. Data from the 2010 National Survey of Residential Care Facilities (NSRCF) were used in logistic regression models.

Results: Odds ratios adjusted for resident and provider characteristics indicate that residents in DSCUs were less likely to have overnight hospital stays and emergency department visits than those in non-DSCUs. In contrast, the odds of having injurious falls did not differ significantly according to DSCU residence status.

Conclusions: RCCs have become a common care provider for cognitively impaired individuals. Study findings indicate that DSCU residence was associated with fewer overnight hospitalizations and emergency department visits.

Keywords: Cognitive impairment, dementia special care unit, adverse events, falls

INTRODUCTION

Cognitive impairment is a well-recognized risk factor among older adults for a number of adverse events including hospitalization, emergency department visits, and falls (Khatutsky et al., 2016; LaMantia Lane, Tu, Carnahan, Messina, & Unrow, 2016; Muri, Gopaul, & Monetero Odasso, 2012; Shaw, 2002; Stephens, Newcomer, Blegen, Miller & Harrington, 2014). Alzheimer's disease is the most well-known form of cognitive impairment (National Institute on Aging, 2016). A national study showed that, in 2014, about 40% of residents in assisted living and similar residential care communities (RCCs) were diagnosed with Alzheimer's disease or other dementias (Caffrey, Harris-Kojetin, Rome, & Sengupta, 2014). Seven of 10 RCC residents had cognitive impairment based on the Minimum Data Set Cognition Scale (MDS-COGS) (Zimmerman, Sloane, & Reed, 2014). In response to the growing number of residents with cognitive impairment, some RCCs provide dementia special care units (DSCUs) in which all or some of the units in the RCC are dementia specific. In 2010, about 17% of RCCs had DSCUs (Park-Lee, Sengupta, & Harris-Kojetin, 2013). A majority of DSCUs are located within larger RCCs as opposed to being units in a stand-alone RCC serving only individuals with dementia. Studies have shown that 64% of DSCUs were located in larger RCCs, while 34% were in stand-alone RCCs that served only individuals with dementia (Park-Lee et al., 2013). DSCUs appear to have certain features in common. Most DSCUs in RCCs had dementia-specific activities and programming (91%), doors with alarms (90%), specially trained staff (88%), enclosed courtyards (82%), and doors with keypads or electronic keys (Park-Lee et al., 2013).

Considerable research has been conducted on the care processes of DSCUs in nursing homes over the years (Cadigan, Grabowski, Givens, & Mitchell, 2012; Gruneir, Lapane, Miller, & Mor, 2008a, 2008b; Leon & Ory, 1999; Luo, Fang, Liao, Elliott, & Zhang, 2010). Less is known about residents living in DSCUs in residential care settings. Most studies of the differences between residents in DSCUs and regular units (i.e., non-DSCU) are based on nursing homes. These studies have found differences in resident as well as provider characteristics between DSCUs and non-DSCUs in nursing homes (Cadigan et al., 2012; Gruneir et al., 2008b; Kok, Berg, & Scherder, 2013; Leon & Ory,

1999; Luo et al., 2010; Phillips, Spry, Sloane, & Hawes, 2000; Zinn & Mor, 1994). Although the literature is inconsistent regarding whether DSCUs are better than traditional nursing home units (Chappell & Reid, 2000; Mitchell, Kiely, & Gillick, 2003; Sidell, 1998; Sloane, Zimmerman, Gruber-Baldini, Hebel, Magaziner, & Konrad, 2005), evidence suggests that residents in special care units are less likely to experience some adverse events, including hospitalizations, but were more likely to have falls (Luo et al., 2010). Given that DSCUs in nursing homes and residential care settings serve similar populations with respect to the degree of cognitive impairment, functional impairment, and disruptive behaviors (Davis et al., 2000), findings on nursing home DSCUs may be applicable to DSCUs in RCCs. While there is no standard definition for special care units, these units are designed for better safety by having locking systems and signposts, as well as a staff that is specially trained to deal with behavioral symptoms (Cerejeira, Lagarto, & Mukaetova-Ladinska, 2012; Kong, Evans, & Guevara, 2009; Luttenberger, Donath, Uter, & Graessel, 2012; Weisman, Kovach, & Cashin, 2004).

DSCUs are a common form of specialized dementia care in RCCs. However, only a few studies have compared characteristics of providers and residents as well as outcomes between DSCUs and non-DSCUs in RCCs (Samus et al., 2008; Sloane et al., 2005; Zimmerman et al., 2014). These studies used a relatively small sample of RCCs (< 200) in one or a few selected states and limited comparisons of RCCs with and without DSCUs to organizational characteristics, such as staffing, medication administration, costs, and admission and discharge policy regarding individuals with moderate-to-severe cognitive impairment. For example, a decline in activities of daily living (ADLs) among RCC residents in DSCUs was more rapid in 12 months than it was among those in non-DSCUs (Sloane et al., 2005). Compared with non-DSCU residents, DSCU residents were more likely to receive psychotropic medications (Samus et al., 2008). RCCs with DSCUs were more likely to be larger and purposely built as an RCC and less likely to be certified or registered to participate in Medicaid than those without DSCUs (Park-Lee et al., 2013). Monthly charges were higher for DSCUs in RCCs than for non-DSCUs (Samus et al., 2008; Zimmerman et al., 2014). RCCs with DSCUs employed more licensed nursing staff than did those with non-DSCUs (Zimmerman et al., 2014).

This study provides a descriptive overview of characteristics of RCC residents 65 and older in DSCUs compared with those of older residents with cognitive impairment but not in DSCUs, and it examines selected care processes and adverse event outcomes in DSCUs in residential care settings. Within the conceptual framework of the widely accepted Donabedian's three elements (structure or context of care, process or transactions between patients and providers, and outcome or the impact of care on the health of individuals or populations) for measuring health care delivery (Donabedian, 2005), we investigated whether DSCUs in RCCs (structure) were associated with selected outcomes among residents with cognitive impairment after controlling for the care processes and resident and organizational characteristics. More specifically, this study aimed to (1) describe and compare characteristics of cognitively impaired RCC residents 65 or older, care processes, and organizational characteristics, according to DSCU residence status; and (2) examine whether residing in a DSCU was associated with lower odds of injurious falls, emergency department visits, or overnight hospital stays among RCC residents with cognitive impairment.

METHODS

Data Source

Data used in this study are from the 2010 National Survey of Residential Care Facilities (NSRCF). The NSRCF, conducted by the National Center for Health Statistics, is a national probability sample survey that collects extensive information about the characteristics of RCCs and their residents (for more information, visit <https://www.cdc.gov/nchs/nsrcf/index.htm>). Conducted as a one-time survey, the NSRCF is the first federal survey that collected information on RCCs with four or more beds and their residents. Since 2012, the biennial National Study of Long-Term Care Providers (NSLTCP) has replaced the NSRCF. The NSLTCP provides information on five long-term care provider sectors (adult day services center, home health agencies, hospices, nursing homes, and RCCs) and their service users. RCCs include assisted living residences, board and care homes, congregate care, enriched housing programs, homes for the aged, personal care homes, and shared housing establishments.

The NSLTCP (2012, 2014, and 2016), while more recent than the NSRCF, only collects aggregated resident data at the provider level, and does not allow for an in-depth analysis of resident characteristics as does the NSRCF. To participate in the NSRCF or NSLTCP, RCCs had to be licensed, registered, listed, certified, or otherwise regulated by the state; provide room and board with at least two meals a day and around-the-clock on-site supervision; help with personal care such as bathing and dressing or health-related services such as medication management; have four or more licensed, certified, or registered beds; and serve a predominantly adult population. RCCs were ineligible if they had no current residents or were licensed to serve only severely mentally ill or intellectually or developmentally disabled populations.

The 2010 NSRCF used a stratified two-stage probability sampling design. The first stage was the selection of communities from the sampling frame representing the universe of RCCs; the second stage was the selection of current residents. For the 2010 NSRCF, 3,605 RCCs were sampled, with probability proportional to size out of a universe (frame) of 39,635 RCCs. Interviews were completed with administrators from 2,302 communities, for a first-stage community-weighted response rate (for differential probabilities of selection) of 81%. Within these communities, data were collected for 8,094 residents 18 or older through in-person interviews with RCC directors or staff; no residents themselves were interviewed. Depending on RCC size, three to six residents were sampled in each participating RCC. Respondents to the resident questionnaires were those who were most knowledgeable about the sampled residents and had access to their medical records; these included directors, registered nurses (RNs), licensed practical nurses/licensed vocational nurses (LPNs/ LVNs), and personal care aides who provided direct care services. With a 99% second-stage resident-weighted response rate, the overall weighted survey response rate for the 2010 NSRCF was 79%. More information on the survey design is available elsewhere (Moss et al., 2011; <https://www.cdc.gov/nchs/nsrcf/index.htm>).

Study Sample

The study sample included RCC residents 65 and older who were identified as having cognitive impairment. Cognitive impairment was defined as having a diagnosis of Alzheimer's disease or other dementia or as scoring mild to severe on the nine-item Minimum Data Set Cognition Scale (MDS-COGS) (Zimmerman et al., 2007). The MDS-COGS scores (ranging from 0 to 10) were then used to measure the severity of cognitive impairment. Individuals were classified as having no cognitive impairment (score of 0), mild cognitive impairment (score of 1 to 2), moderate cognitive impairment (score of 3 to 5), or severe cognitive impairment (score of 6 or higher). More information on the MDS-COGS is provided in the following section. There were 6,854 residents 65 years or older: 5,194 had cognitive impairment and 1,660 did not. Of the 1,660 residents who did not have cognitive impairment, 194 (or 3%, weighted for the probability of selection, unknown eligibility, and nonresponse) were diagnosed with dementia but were scored as having no cognitive impairment, as measured by the MDS-COGS. These 194 cases were excluded from the analysis because it is unlikely that residents diagnosed with Alzheimer's disease or other dementias would not exhibit any of the symptoms included in the MDS-COGS, and these results may indicate reporting errors. This finding may also indicate that a form of treatment may have reduced the symptoms of cognitive impairment such that a person scores well on the cognitive impairment measures and still has a diagnosis of Alzheimer's disease.

Variables

Outcome measures. Three resident outcomes were examined in this study: (1) injurious falls (a fall that caused a hip fracture or any other injury in the past 12 months or since admission); (2) hospitalization (admitted to a hospital overnight or longer, excluding trips to the emergency department that did not result in a hospital stay in the past 12 months or since admission); (3) and emergency department visits (treated at a hospital emergency department in the past 12 months or since admission). Hospitalizations and ER visits were for any reason and not limited to falls.

Dementia Special Care Unit. Residents were identified

as residing in a DSCU if respondents stated that the resident lived in a distinct unit, wing, or floor designated as a dementia or Alzheimer's special care unit within an RCC, or lived in a community that only served adults with dementia. If residents lived in communities without special care units, they were coded as residing in a non-DSCU. An earlier study using the same data indicated that almost all DSCUs offered dementia-specific activities and programming and had alarmed doors, and most had specially trained staff, an enclosed courtyard, doors with keypads and electronic keys, and locked exit doors (Park-Lee et al., 2013).

MDS-COGS. MDS-COGS is a 10-point scale developed to assess the severity of cognitive impairment, with higher scores indicating greater cognitive impairment. The MDS-COGS items were scored, with 1 point assigned for each of the following survey items: long-term memory impairment, short-term memory impairment, inability to locate one's own room, not knowing that he or she lived in a residential care setting, could rarely or never make oneself understood, and needing assistance with dressing (total of 6 points). A point was assigned if a resident could not identify any of the four recall items: location of room, knowing that he or she lived in a residential care community, one's own name, and knowing the current season. An additional 1 to 3 points were given for the decision-making question: 1 point if the resident's decision-making was modified independent; 2 points if it was moderately impaired; and 3 points if it was severely impaired. The points assigned to the survey items were based on earlier studies that used the MDS-COGS measure. Following Zimmerman et al. (2007), we collapsed the MDS-COGS measure into none (score 0), mild (score 1 to 2), moderate (score 3 to 5), and severe (score 6 and higher). MDS-COGS was originally developed to measure the presence and severity of cognitive impairment in nursing home residents (Hartmaier, Sloane, Guess, & Koch, 1994) and was found to be a reliable and valid measure to be used in residential care settings (Zimmerman et al., 2007).

Other resident characteristics. Other resident characteristics included age; sex; race/ethnicity; length of stay; receiving long-term care services paid by Medicaid; being blind or having any trouble seeing, even with glasses or contact lenses; number of ADLs (i.e., eating, dressing, bathing, toileting,

transferring, and walking) for which residents received any assistance from special equipment, another person, or both; bowel or urine incontinence; and number of comorbid conditions (i.e., anemia, arthritis, asthma, cancer, cerebral palsy, chronic bronchitis, congestive heart failure, chronic obstructive pulmonary disease, coronary heart disease, diabetes, depression, emphysema, glaucoma, gout, heart attack, hypertension, kidney disease, macular degeneration, muscular dystrophy, nervous system disorders, osteoporosis, other mental or nervous condition, partial or total paralysis, serious mental problems, spinal cord injury, stroke, traumatic brain injury, any other kind of heart disease). In addition to using a simple count of comorbid conditions in the models, we used individual comorbid conditions in separate models to assess whether there were differences in the outcome. Because there were no differences in the outcome, the results presented here are based on models using a count of comorbid conditions.

Care process–related measures. Care processes were measured using the following: resident influenza vaccination status (having been vaccinated while residing at the facility or vaccinated before admission to the facility during the past 12 months); ever prescription of medications to help control the resident’s behaviors or reduce agitation; and number of services used by the resident. Services included special diets, assistance with ADLs, assistance with a bath or shower at least once a week, skilled nursing services, basic health monitoring, social and recreational activities, incontinence care, transportation, personal laundry, linen laundry services, social services counseling.

Organizational characteristics of RCCs. Organizational characteristics of RCCs were size (4 to 25 beds, 26 to 100 beds, > 100 beds), ownership (for-profit versus nonprofit and government), and metropolitan statistical area (MSA) status. Other organizational characteristics included use of electronic health records, licensed nursing staff direct care hours per resident per day, and aide direct care hours per resident per day. Licensed nursing staff included LPNs/LVNs and RNs. Aides were personal care aides, certified nursing assistants, and medication technicians.

Data Analysis

We used SAS-callable SUDAAN (version 11.0.0) to take into account the complex sample design of the NSRCF. The unit of analysis was the resident. All residents in the same RCC had the same values for RCC characteristics, such as ownership, facility’s use of electronic health records, and aide direct care hours per resident per day. Design variables and weights were used to adjust for this clustering. The SUDAAN procedures nest residents in the residential community in which they live, as in hierarchical modeling. Chi-square and *t* tests were conducted to examine differences in resident characteristics, care processes, and organizational characteristics between residents in DSCUs and those in non-DSCUs (**Table 1**). We used multivariate logistic regression analyses to assess whether being in a DSCU was associated with having injury-causing falls, hospitalization, and emergency department visits among residents with cognitive impairment. These models were adjusted by controlling for selected resident, organizational, and care process characteristics. All statistical significance tests were 2-sided, with $p < .05$ as the level of statistical significance.

We excluded from the bivariate and multivariate analyses any cases with missing data on any of the variables, which resulted in reducing the sample from 5,194 to 5,143 individuals. Excluded were 1% of cases with missing data on any of the variables in the analyses. First, we compared cases with and without missing data in terms of demographic characteristics, such as age, race, and sex. There were no significant demographic differences between the two groups. Secondly, regression results from the analytic sample were compared with regression results using the larger sample with missing data. We found no differences in the direction of or level of significance in the associations in the data.

RESULTS

Resident Characteristics, by DSCU Residence Status

Our data show that nationally about 473,000¹ RCC residents (or 75%) were cognitively impaired. About 21.5% of the cognitively impaired residents lived in DSCUs. More than one half of the RCC residents with cognitive impairment were 85 years or older (60.9%), female (73.6%), and lived at the current RCC for more than a year (66.2%) regardless of their DSCU residence status (**Table 1**). Compared with those in non-DSCUs, higher percentages of residents with cognitive impairment in DSCUs had severe cognitive impairment (70.8% vs. 21.9%), received assistance in three or more ADLs (80.3% vs. 60.2%), and were incontinent (69.2% vs. 46.2%). Lower percentages of DSCU residents than those in non-DSCUs used Medicaid to pay for their long-term care services (10.7% vs. 16.2%), had difficulty seeing even with glasses or were blind (14.5% vs. 18.9%), and had three or more comorbid conditions (35.2% vs. 46.8%).

¹5,143 cases weighted by the probability of selection of the RCC and adjusted for unknown eligibility and nonresponse. The purpose of the unknown eligibility adjustment was to inflate the weights so that they accounted for the cases that were likely to be eligible from among the pool of cases for which eligibility was unknown. Adjustments were made for nonresponse to account for the cases that were eligible but had not completed the survey.

Care Processes and Organizational Characteristics, by DSCU Residence Status

Similar percentages of residents in DSCUs and non-DSCUs had influenza vaccinations (82.4% and 79.9%, respectively). Compared to 19.1% of non-DSCU residents, 49.0% of DSCU residents had a physician ever prescribe medications to help control their behaviors or reduce agitation. A higher percentage of residents in DSCUs than in non-DSCUs used six or more services (93.5% vs. 82.3%).

Higher percentages of residents in DSCUs than in non-DSCUs lived in RCCs that were 26 to 100 beds (60.4% vs. 51.2%), private for-profit (81.9% vs. 74.9%), and located in an MSA (89.3% vs. 82.9%). About one quarter of cognitively impaired residents—irrespective of their DSCU residence status—lived in RCCs that used electronic health records. Residents in DSCUs resided in RCCs that had higher mean licensed nursing

staff hours per resident per day (0.3 hour vs. 0.2 hour) and aide hours per resident per day (2.3 hours vs. 1.8 hours) than those in non-DSCUs.

Selected Resident Outcomes by DSCU Residence Status

Injurious falls. About 17.9% of residents with cognitive impairment had injurious falls (**Table 2**). Compared with those in non-DSCUs, DSCU residents were more likely to have had falls that caused hip fracture or other injuries (21.6% vs. 16.9%; $p < .01$). However, when resident characteristics, care processes, and organizational characteristics were adjusted for, the odds of injurious falls were comparable for residents in DSCUs and those in non-DSCUs (adjusted odds ratio [AOR] = 0.97; 95% confidence interval [CI], 0.74–1.26).

Hospitalization. One of four residents (25.3%) with cognitive impairment had been a patient at a hospital overnight or longer. A higher percentage of residents in non-DSCUs than in DSCUs had been hospitalized (26.3% vs. 21.5%; $p < .05$). Even after controlling for resident characteristics, care processes, and organizational characteristics, residents in DSCUs were less likely to have been hospitalized than those in non-DSCUs (AOR = 0.68; 95% CI, 0.52–0.87).

Emergency department visits. A similar percentage of residents in DSCUs and non-DSCUs were treated in a hospital emergency department. Yet, when resident, organizational, and care process–related characteristics were controlled for, residents in DSCUs had lower odds of emergency department visits than those in non-DSCUs (AOR = 0.73; 95% CI, 0.58–0.92).

Table 1. Characteristics (Weighted) of Residents 65 or Older With Cognitive Impairment (CI), Care Processes, and Organizational Characteristics, By Dementia Special Care Unit (DSCU) Status, *continued on page 10*

Characteristic	Residents With CI (N = 5,143)		Residents With CI in DSCU (n = 935)		Residents With CI in non-DSCU (n = 4,208)		Significant p Value
	%	(SE)	%	(SE)	%	(SE)	
Total	100		21.5		78.5		
Resident Characteristics							
Age, years							
< 85	39.1	(0.9)	41.8	(1.8)	38.4	(1.0)	
≥ 85	60.9	(0.9)	58.2	(1.8)	61.6	(1.0)	
Sex							
Male	26.4	(0.8)	28.9	(1.7)	25.7	(0.8)	
Female	73.6	(0.8)	71.1	(1.7)	74.3	(0.8)	
Race/Ethnicity							
Non-Hispanic/ White	91.5	(0.5)	94.1	(0.9)	92.1	(0.6)	< .05
Other	7.5	(0.5)	5.9	(0.9)	7.9	(0.6)	< .05
Length of Stay							
≤ 1 year	33.8	(0.8)	35.9	(1.7)	33.2	(0.9)	
> 1 Year	66.2	(0.8)	64.1	(1.7)	66.8	(0.9)	
Medicaid Paying for Long-term Care Services	15.0	(0.8)	10.7	(1.3)	16.2	(0.9)	< .001
Cognitive Impairment							
Mild	38.2	(0.9)	5.7	(0.9)	47.2	(1.0)	< .001
Moderate	29.4	(0.8)	23.5	(1.7)	31.0	(0.9)	< .001
Severe	32.4	(0.9)	70.8	(1.8)	21.9	(0.8)	< .001
Difficulty seeing (even with glasses or contact lenses) or blind	18.0	(0.8)	14.5	(1.4)	18.9	(0.9)	< .05
No. of ADLS for which help needed							
0-2	35.5	(0.9)	19.7	(1.6)	39.8	(1.0)	< .001
3-4	36.7	(0.9)	39.5	(1.9)	36.0	(0.9)	< .05
5-6	27.8	(0.8)	40.8	(1.9)	24.2	(0.8)	< .001
Bowel or urine incontinent	51.1	(1.0)	69.2	(1.9)	46.2	(1.1)	< .001
No. of comorbid conditions							
None	8.9	(0.5)	12.0	(1.3)	8.1	(0.6)	< .01
1-2	46.8	(0.9)	52.8	(1.9)	45.2	(1.0)	< .001
≥ 3	44.3	(1.0)	35.2	(1.9)	46.8	(1.1)	< .001
Care Processes							
Had influenza vaccination	80.4	(0.9)	82.4	(1.6)	79.9	(0.9)	
Physician prescribed medications to control behaviors or reduce agitation	25.5	(0.9)	49.0	(2.1)	19.1	(0.8)	< .001
No. of services used							
0-5	15.4	(0.8)	6.5	(1.0)	17.8	(1.0)	< .001
6-10	77.6	(0.9)	87.3	(1.2)	75.0	(1.0)	< .001
11-13	7.0	(0.5)	6.2	(0.9)	7.3	(0.5)	
RCC uses electronic health records	26.2	(1.4)	24.5	(2.4)	26.6	(1.5)	

Note. SE = standard error; RCC = residential care communities, ADL = activities of daily living. All estimates and standard errors are weighted.
Source. National Center for Health Statistics. (2010). National Survey of Residential Care Facilities. <https://www.cdc.gov/nchs/nsrcf/index.htm>

Table 1. Characteristics (Weighted) of Residents 65 or Older With Cognitive Impairment (CI), Care Processes, and Organizational Characteristics, By Dementia Special Care Unit (DSCU) Status, *continued*

Characteristic	Residents With CI (N = 5,143)		Residents With CI in DSCU (n = 935)		Residents With CI in non-DSCU (n = 4,208)		Significant p Value
	%	(SE)	%	(SE)	%	(SE)	
Organizational Characteristics							
Size							
4–25 beds	19.5	(0.5)	13.2	(1.3)	21.2	(0.6)	< .001
26–100 beds	53.2	(1.0)	60.4	(2.4)	51.2	(1.1)	< .001
> 100 beds	27.4	(1.0)	26.4	(2.3)	27.6	(1.1)	
Private, for profit	76.4	(1.3)	81.9	(2.1)	74.9	(1.4)	< .01
Metropolitan statistical area	84.3	(0.9)	89.3	(1.5)	82.9	(1.0)	< .01
	Mean	(SE)	Mean	(SE)	Mean	(SE)	
Licensed nursing staff hours per resident per day	0.2	(0.0)	0.3	(0.0)	0.2	(0.0)	< .001
Aide hours per resident per day	2.0	(0.0)	2.3	(0.1)	1.8	(0.0)	< .001

Table 2. Prevalence of Selected Outcomes Among Residents 65 or Older With Cognitive Impairment (CI) and Associations With Dementia Special Care Unit (DSCU) Residence Status

Outcome	Prevalence			Significant p Value	Crude Odds		Adjusted Odds ^a	
	All residents with CI	Residents with CI in DSCUs	Residents with CI in non-DSCUs		OR	95% CI	OR	95% CI
	% (SE)	% (SE)	% (SE)					
Injurious falls	17.9 (0.7)	21.6 (1.6)	16.9 (0.8)	< .01	1.36	1.09–1.69	0.97	0.74–1.26
Hospitalizations	25.3 (0.8)	21.5 (1.6)	26.3 (0.9)	< .05	0.77	0.62–0.95	0.68	0.52–0.87
Emergency department visits	37.4 (0.9)	34.8 (1.9)	38.1 (1.0)		0.87	0.72–1.04	0.73	0.58–0.92

Note. SE = standard error; OR = odds ratio; CI = confidence interval.

^aAdjusted for resident characteristics (age, sex, race/ethnicity, length of stay, Medicaid paying for long-term care services, severity of cognitive impairment, vision problems, number of activities of daily living for which help is needed, incontinence, number of comorbid conditions), care processes (influenza vaccination, physician prescribing medications to control behavior, number of services used, facility using electronic health records, licensed nursing staff direct care hours per resident per day, aide direct care hours per resident per day) and organizational characteristics (facility size, for-profit ownership, metropolitan statistical area status).

DISCUSSION

Based on these results, nationally, three of four RCC residents 65 or older in 2010 had symptoms of cognitive impairment. More than half of these residents were diagnosed with Alzheimer's disease or another dementia by a physician or other health care professional, while the remaining did not have a diagnosis of dementia recorded in the survey but exhibited one or more cognitive impairment symptoms. Most RCC residents with symptoms of cognitive impairment lived in non-DSCUs where they were mixed in with other residents without cognitive impairment. About 21.5% of cognitively impaired residents lived in a distinct unit, wing, or floor designated as a DSCU within a larger RCC or in a community serving only adults with dementia. Of these, 36% lived in RCCs that only served adults with dementia and 64% lived in RCCs that had a distinct unit, wing, or floor designated as a DSCU within a larger RCC (data not shown).

Although previous research has focused on nursing home residents living in DSCUs, relatively little is known about residential care residents who live in DSCUs. Residential care is gaining popularity as a source of dementia care (Kang, Smith, Buckwater, Ellingrod, & Schultz, 2010; Smith et al., 2008). This study sheds light on the characteristics of residents living in DSCUs and non-DSCUs in residential care settings, and examines their odds of experiencing adverse outcomes. Our data show that resident characteristics varied between residents in DSCUs and those in non-DSCUs. For example, compared with residents in non-DSCUs, a higher percentage of DSCU residents were non-Hispanic White and more cognitively and functionally impaired and had fewer comorbid conditions.

These findings are largely consistent with those of previous studies, with the exception of functional impairment (Cadigan et al., 2012; Coleman, Barbaccia, & Croughan-Minihane, 1990; Johnson & Gerstein, 1998; Leon & Ory, 1999; Luo et al., 2010; Samus et al., 2008; Zimmerman et al., 2014). Compared with cognitively impaired residents in non-DSCUs in nursing homes, DSCU residents in nursing homes were more likely to be White, private pay residents, had more severe cognitive impairment, but had fewer comorbid conditions (Gruneir et al., 2008b; Leon & Ory, 1999; Luo et al., 2010; Zinn & Mor, 1994). However,

these studies found that residents in DSCUs were less functionally impaired than those in non-DSCUs (Coleman et al., 1990; Gruneir et al., 2008b). These inconsistencies may be explained by the way in which ADL impairment was measured (receipt of assistance in performing ADLs measured in this study, whereas other studies measured self-performance of ADLs) and by the type of ADLs included.

Except for influenza vaccination, statistically significant differences were observed between residents in DSCUs and those in non-DSCUs relative to care processes. A higher percentage of DSCU residents had a physician prescribe medications to help control their behaviors, and they used more services. Similar results were reported among nursing home residents in DSCUs, who exhibited more problem behaviors, were more likely to receive psychotropic medications, and were more likely to have sustained falls than those in non-DSCUs, while physical restraint use was comparable between DSCUs and non-DSCUs (Cadigan et al., 2012; Gruneir et al., 2008b; Kok et al., 2013; Leon & Ory, 1999; Luo et al., 2010; Phillips et al., 2000). Similarly, organizational characteristics of RCCs in which DSCU residents resided and those in which non-DSCU residents resided varied relative to size, ownership, MSA status, and staffing. For example, consistent with previous findings, residents in DSCUs lived in RCCs that had higher mean licensed nursing staff and aide hours per resident per day than those in non-DSCUs.

To assess differences in outcomes between residents living in DSCUs and those living in non-DSCUs, injurious falls, hospitalizations, and emergency department visits were examined among cognitively impaired residents in RCCs. Although injurious falls occurred more frequently among residents in DSCUs (21.6%) than among those in non-DSCUs (16.9%), adjusted estimates indicated that the odds of injurious falls for residents with cognitive impairment did not differ significantly by DSCU residence status. This finding is different from that in previous research reporting higher odds of falls among DSCU nursing home residents than among non-DSCU residents (Luo et al., 2010; Nazir, Mueller, Perkins, & Arling, 2012). Inconsistencies in these findings may be due to the fact that previous studies measured any falls as opposed to injurious falls. To our knowledge, no other studies observed an association between DSCU residence and fewer falls. The NSRCF shows that a majority of DSCUs

in RCCs reported having certain physical features (e.g., doors with alarms, enclosed courtyard) for the care of cognitively impaired residents (Park-Lee et al., 2013). However, it is unclear how these features are associated with preventing wandering residents in DSCUs from falls as they may not stop them from walking around within the unit.

In this study, residents in DSCUs were less likely to have overnight hospital stays than those in non-DSCUs. Previous studies also found that DSCU residents in nursing homes had fewer hospitalizations (Cadigan et al., 2012; Luo et al., 2010) as well as a lower incidence of hospitalization than those in non-DSCUs (Sloane et al., 2005). We also observed lower odds of emergency department visits among residents in DSCUs than among those in non-DSCUs. An earlier report found no differences in emergency department visits in nursing home residents by DSCU status (Luo et al., 2010). Earlier studies also found that DSCU nursing home residents were more likely to have advance directives, such as a do-not-hospitalize order, that may be related to fewer hospitalizations (Cadigan et al., 2012).

Earlier studies in nursing homes and RCCs have found that implementing best practices and staff training may be more effective in caring for residents with cognitive impairment and helping them age in place than the DSCU residence (Coleman et al., 1990; Lai, Yeung, Mok, & Chi, 2009; Phillips et al., 2000; Sloane et al., 2005; Zimmerman et al., 2014). The current study indicates that while there are little-to-no differences in injury-causing falls according to DSCU residence, residents in DSCUs are less likely to have overnight hospital stays and emergency department visits. Previous studies using nursing home data suggest that having a special care unit is associated with a “distinct practice style” (Gruneir, Miller, Intrator, & Mor, 2007), and the same may apply to residential care settings.

A few study limitations are worth noting. First, because of the cross-sectional nature of the survey, causal inference should not be drawn from the findings. Second, because NSRCF did not collect information on how long sampled residents had resided in DSCUs, it is possible that residents could have moved to a DSCU after an adverse event such as an injurious fall. Third, these data do not link falls to emergency department visits or hospitalizations as an indicator of whether an emergency department visit or overnight hospitalization

was necessary. Finally, the NSRCF data are relatively old, having been collected in 2010; however, to date, these are the only nationally representative data that provide individual-level information on residents living in residential care settings.

In addition, this study adjusted for a variety of resident, care process, and organizational characteristics available in NSRCF to examine the association between selected resident outcomes and DSCU residence status. However, there may be other covariates that were not included and therefore could not be controlled for. While assisted living may have evolved since 2010, these findings are relevant to the current residential care landscape. RCCs increasingly include people with multiple and complex health issues and with a rise in acuity, the 2016 assisted living regulations have focused on staffing and related training and dementia care, among other areas of improvement (Berdzik, 2015; National Center for Assisted Living, 2016). These findings can help us better understand the relationship between adverse effects and specialized dementia care, as communities work to meet the regulatory requirements. Despite the limitations, this study is the first, to our knowledge, to provide a descriptive overview of cognitively impaired residents in DSCUs relative to resident characteristics, care processes, and organizational characteristics, as well as to examine the differences between DSCU and non-DSCU residence relative to injurious falls, hospitalizations, and emergency department visits using nationally representative data on RCC residents in the United States.

CONCLUSION

About 21.5% of cognitively impaired RCC residents 65 or older lived in DSCUs, and they were different from those in non-DSCUs relative to selected characteristics. RCCs have become a more common provider for cognitively impaired individuals over the years (Smith et al., 2008; Zimmerman et al., 2014). Most previous findings about special care units are from nursing homes, with a few exceptions using local or regional data from residential care settings. Using data from the nationally representative NSRCF, this study provides insights about the relationship between residence in a DSCU and a set of selected adverse outcomes. This study’s findings suggest that residing in DSCUs is associated with lower odds of hospitalization

and emergency department visits, while it has no relationship with injurious falls. These findings can be used to inform future analyses to explore factors that may explain the association between special care settings and adverse events.

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