Published in final edited form as:

Neurol Urodyn. 2018 January ; 37(1): 229–236. doi:10.1002/nau.23279.

Time to and Predictors of Dual Incontinence in Older Nursing Home Admissions

Donna Z. Bliss, PhD, RN^a, Olga V. Gurvich, MA^a, Lynn E. Eberly, PhD^b, and Susan Harms, PhD, RPh^{a,c}

^aUniversity of Minnesota School of Nursing, Minneapolis, MN

^bSchool of Public Health Division of Biostatistics, Minneapolis, MN

^cCollege of Pharmacy, Minneapolis, MN

Abstract

There are few studies of nursing home residents that have investigated the development of dual incontinence, perhaps the most severe type of incontinence as both urinary and fecal incontinence occur.

Aims—To determine the time to and predictors of dual incontinence in older nursing home residents.

Methods—Using a cohort design, records of older nursing home admissions who were continent or had only urinary or only fecal incontinence (n=39,181) were followed forward for report of dual incontinence. Four national U.S. datasets containing potential predictors at multiple levels describing characteristics of nursing home residents, nursing homes (n=445), and socioeconomic and sociodemographic status of the community surrounding nursing homes were analyzed. A Cox proportional hazard regression with nursing home-specific random effect was used.

Results—At six months after admission, 28% of nursing home residents developed dual incontinence, at one year 42% did so, and at two years, 61% had dual incontinence. Significant predictors for time to developing dual incontinence were having urinary incontinence, greater functional or cognitive deficits, more comorbidities, older age, and lesser quality of nursing home care.

Conclusions—The development of dual incontinence is a major problem among nursing home residents. Predictors in this study offer guidance in developing interventions to prevent and reduce the time to developing this problem which may improve the quality of life of nursing residents.

Keywords

incontinence; dual incontinence; incidence; risk factors; epidemiology; nursing homes; aged

Dual incontinence describes concurrent urinary and fecal incontinence and has been reported in more than 40% of the nursing home population.^{1–4} The high costs of incontinence have

^aCorresponding Author: Donna Z. Bliss, PhD, RN, University of Minnesota School of Nursing, 5-140 Weaver-Densford Hall, 308 Harvard Street, Minneapolis, MN 55455; bliss@umn.edu; Ph:612-624-1425.

been documented including monetary healthcare expenditures,^{5,6} comorbidities such as skin damage⁷ and distressing psychosocial consequences.⁸ Much of the collective knowledge of dual incontinence in nursing homes is based principally on cross-sectional, prevalence studies.^{1–4} Two factors most often associated with dual incontinence in cross-sectional or comparative studies are cognitive impairment and diminished capability for performing activities of daily living (ADLs).^{2,4,9} Various other correlates associated with dual incontinence in some studies include older age, stroke, bowel problems such as constipation and diarrhea, emphysema, fewer medications, and longer length of nursing home stay.^{2,4} Only one study¹⁰ investigating the incidence of dual incontinence among a subset of nursing home residents was found. Of the 3,850 residents in nursing homes in one state in the United States (U.S.) who were continent in the first year of observation, 12.4% had developed dual incontinence at follow-up in the second year.¹⁰ Consequently, evidence for predictors of dual incontinence in nursing home residents is scarce.

The risk factors of dual incontinence that were identified in the study by Nelson et al.,¹⁰ were limitations in ADLs, dementia, use of trunk restraints, and being of non-White race. The findings of Nelson et al.¹⁰ suggest that racial and ethnic disparities in nursing home care may contribute to the development of dual incontinence. Our team has reported racial disparities in prevention of any incontinence for older Black residents¹¹ and in resolution/cure of any incontinence for older Hispanic residents.¹² Social epidemiologists assert that analysis of individual level factors is insufficient to assess population-level, complex problems such as incontinence in nursing homes and that group level (i.e., nursing home and community) factors must be considered.¹³ For example, worse health outcomes and higher percentages of minorities are found in nursing homes in poorer communities with fewer resources¹⁴ or in certain geographic location in the country.^{15,16}

The purpose of this study was to determine the time to and predictors of dual incontinence among older adults who were continent or had only urinary or only fecal incontinence at nursing home admission. Potential predictors at the individual, nursing home and community levels were considered.

Methods

Data Files

Three national data files were linked and analyzed: (1) the Minimum Dataset (MDS) version 2.0 provided demographic and health assessment information about individual residents of a national for-profit chain of nursing homes from years 2000–2002, (2) Online Survey, Certification, and Reporting (OSCAR) records from the same years contained data about nursing home staffing, the care environment, and deficiencies in quality of care, and (3) the 2000 U.S. Census had socioeconomic and sociodemographic measures of the Census tract of the community in which a nursing home was located. The XXX Population Center at the XXX of XXX, [city, state], identified the census tracts of the nursing homes. Data were coded and deidentified, and the XXX of XXX Institutional Review Board determined the study was exempt.

Design, Cohort, and Outcome Variables

The study used a cohort design. The cohort was comprised of older nursing home admissions (aged ≥ 65 years) who were free of dual incontinence per their admission MDS record, i.e., they were continent or usually continent of both urine and feces or had urinary incontinence only or fecal incontinence only. Dual incontinence was defined as the report of both urinary and fecal incontinence on the same MDS record. MDS records after nursing home admission were searched forward until a record of incident dual incontinence was identified or available records ended. The admission cohort of nursing home residents in this study was shown to be comparable to older adults admitted to all Medicare/Medicaid certified nursing homes in the United States during the same time period.¹⁷ Residents with an indwelling urinary catheter or ostomy at admission or at follow up were excluded.

Predictor variables

Development of potential predictors was previously described.^{11,18} As incontinence in nursing homes is multi-factorial, predictors at the resident, nursing home, and community levels were identified from a review of the literature and expertise of the investigators and three clinical consultants. Predictors considered were individual items on the data records as well as established scales with good psychometric properties since several items on a data record may have been related to the same concept. Where no scale existed but was needed, composite measures were developed. Scales and composite variables used in these models were coded so that a higher score indicated a worse status.

Individual resident level predictors included measurements of demographic characteristics (e.g., gender), functional ability (e.g., limitations in ADLs), cognitive/memory deficits, physical problems (e.g., oxygenation problems), and emotional status (e.g., depressive symptoms). Nursing home level predictors described facility and care deficiencies, staffing levels for various types of staff, percentages of residents by gender, race, Hispanic ethnicity, and types of incontinence, and the percentage of residents whose care was reimbursed by the federal Medicaid program. Community level predictors included indicators of the sociodemographic and socioeconomic status of the Census tract community in which each nursing home was located. Example variables were proportions of racial groups in the tract community, the proportion of the tract population that was working class, in an urban area, or below poverty level, and the median value of homes in the tract.

Variables were screened for inclusion in the model using bivariate associations with the outcome and those with an association at $p < .05$ were considered model candidates. Bivariate associations between variables were also performed to assess potential multicollinearity. If a resident level and nursing home/community level variable were highly correlated, the resident level variable was used because it was more specific. Potential predictors included in the model for time to dual incontinence were age, limitations in ADLs, co-morbidities, cognitive deficits, having only urinary or only fecal incontinence at nursing home admission (reference group was being continent), deficiencies in nursing home quality of care, and percentage of nursing home residents receiving Medicaid. Because previous analyses showed disparities for Black and Hispanic residents for other incontinence-related outcomes,^{11,12} Black race and Hispanic ethnicity were included in the

model and the reference group was all other races combined (i.e., White, American Indian, and Asian).

Statistical modeling was conducted using Cox proportional hazard regression with a nursing home-specific random intercept to account for clustering of the residents within nursing homes and for unobserved heterogeneity. The proportion of residents remaining free of incontinence was graphed and reported at selected time points. Data management and descriptive statistics were performed using IBM SPSS v. 22 (IBM Corp., Armonk, NY) or SAS v. 9.3 (SAS Institute Inc., Cary, NC). SAS v. 9.3 was used for modeling and R software v. 3.1.3 (The R Foundation for Statistical Computing) was used for graphing. Results were considered statistically significant when $p < .05$.

Results

Description of the Cohort

There were 39,181 adults in the cohort of whom 89.6% were White Not Hispanic, 7.0% were Black Not Hispanic, 1.3% were Hispanic, 1.5% were Asian or Pacific Islander, and 0.5% were American Indian or Alaskan Native. Race/ethnicity data were missing for one resident. The mean (sd) age of the cohort was 81.3 (7.6) years and most were female (69.2%). More than half (58%) had a high school education or greater. Table 1 describes the physical and functional status of the cohort. The cohort was slightly obese on average. Their level of limitation in ADLs was moderate as was their mortality risk. More than one-third of the cohort had oxygenation or perfusion problems. Approximately 40% of the cohort had poor nutrition or vision impairment. However, the comorbidity index was low on average. Approximately one-fifth of the cohort had only urinary incontinence whereas a smaller percentage (2%) had only fecal incontinence. Use of restraints or tube feeding was low (< 2% of residents).

The emotional and cognitive characteristics of the cohort are presented in Table 2. The average level of cognitive deficits was moderate. Approximately one-fifth of the cohort had some delirium. The percentage of the cohort with communication and discomfort behaviors was low. Nearly 30% of the cohort had signs/symptoms of depression.

The residents were admitted to 445 nursing homes in 27 states located in all nine Census divisions. The total number of deficiencies in quality of nursing home care was 3.80 (2.30) and the index for the scope and severity of deficiencies in quality of care was 7.70 (6.30) (mean (sd)). The percentage of residents on Medicaid was 74% (15.5) (mean (sd)). As nursing staff primarily assist residents with toileting and continence/incontinence management, the hours/resident day for certified nursing assistants (2.20 (2.10)) (mean (sd)) and licensed nurses (1.10 (0.50)) were calculated. Hours for licensed nurses were half those of the certified nursing assistants. Characteristics of the Census tract communities in which the nursing homes were located are summarized in Table 3. The communities had diverse populations though the percentage of some racial and ethnic groups was small. Approximately half of the nursing homes (49.7%) were in urban locations. Most nursing homes (74.4%) were in communities in which 50 to 75% of the population was working class. The vast majority of nursing homes (91%) were in communities where <25% of the

tract population was below poverty. Additionally, the median household income was \$25,000 to < \$50,000 in the communities surrounding 73.5% of the nursing homes and \$50,000 to < \$75,000 in communities surrounding 14.2% of nursing homes.

Time to and Predictors of Dual Incontinence

Of the 39,181 admissions, 24.6% developed dual incontinence. Of these, 35.5% had urinary incontinence only at nursing home admission, and 4% were admitted with fecal incontinence only. Figure 1 shows the proportion of nursing home admission who remained free of dual incontinence over time. At three months (90 days) after admission, 81% of residents were free of dual incontinence, and at six months (180 days), 72% of residents had not developed dual incontinence. At one and two years after admission, 58% and 39% of residents, respectively, remained free of dual incontinence.

Predictors of time to dual incontinence are listed in Table 4. More nursing home admissions developed dual incontinence and did so sooner if they had urinary incontinence, greater limitations in ADLs, greater severity of cognitive deficits, or more comorbidities, or if they were older. Residing in a nursing home with lower quality of care was another predictor of developing dual incontinence. Having only urinary incontinence was the strongest predictor: the hazard of developing dual incontinence for residents with urinary incontinence was 1.3 times greater than the hazard for those who were continent.

Discussion

The findings of this study add much needed knowledge about the course and predictors of dual incontinence after nursing home admission. By six months, nearly one-third of admitted residents had developed dual incontinence while, at one year, the percentage of residents with dual incontinence increased to about 40%. The results of this study raise awareness that development of dual incontinence is a common problem that develops relatively soon after nursing home admission. The predictors of time to developing dual incontinence provide guidance for strategies to manage and prevent incontinence in nursing home residents. The strongest predictor of time to dual incontinence in this study was the presence of urinary incontinence. Interventions to strengthen the pelvic floor, for example by practicing pelvic floor muscle exercises, which have been shown to reduce the severity of urinary incontinence,¹⁹ may help to avoid or delay the occurrence of dual incontinence. Two other predictors of time to dual incontinence, greater deficits in ADL and cognitive function, have been identified as correlates of dual incontinence in observational cross-sectional studies. In a systematic review of 14 trials that investigated treatments for urinary incontinence in nursing home residents, Fink et al.²⁰ concluded that prompted voiding with or without exercise was associated with decreases in daytime urinary incontinence. However, two studies which attempted to improve functioning and continence in nursing home residents using programs with toileting or toileting and exercise interventions showed success primarily in reducing urinary but not fecal incontinence.^{21,22} Preventing dual incontinence seems to require interventions that are designed specifically for both urinary and fecal incontinence.

Some nursing home residents with functional or mobility limitations are highly dependent on timely toileting assistance from nursing staff to remain continent. Some estimates suggest that nursing home staffing may be less than the assistance needed, but the adequate mix of resources including staffing, type of continence program, staff education, incentives, etc. to improve continence rates is unclear.²³ Use of new technologies or changes in staffing/practice models could assist nursing staff in meeting residents' continence needs. A suspension positioning system aimed to promote cleansing after an incontinent episode in elderly bedridden patients with neurogenic fecal incontinence lowered skin damage and urinary tract infections; similar technologies might facilitate timely positioning of dependent residents on a bedpan to prevent incontinence and skin soiling.²⁴ With regard to nursing home practice, implementation of a care delivery model that included advance practice nurses (nurse practitioners or clinical nurse specialists) in nursing homes was associated with lower rates of urinary incontinence but dual incontinence was not examined.²⁵ A study underway in Norway is examining the effectiveness of a comprehensive education program for general nursing home staff in reducing rates of fecal incontinence.²⁶

There are limitations to our study. As our data are from propriety nursing homes, there is limited generalizability of results to non-profit nursing homes. We have shown that the characteristics of our admission cohort are comparable to residents in all U.S. NHs¹⁷ and for-profit nursing homes still constitute the majority (71%) of U.S. nursing homes.²⁷ Not all relevant predictors of dual incontinence may be known, available in our datasets, identifiable by screening procedures, or possible to include in our models. Since the time of our data there have been some new drug treatments of urinary incontinence and federal regulations requiring individualized care planning for incontinence management. We utilized multiple national datasets that were time-concurrent with the available U.S. Census data at the start of our analyses, a strength of the study.

Other strengths of our study are the inclusion of all residents at risk for dual incontinence in our cohort, i.e., those who had either urinary or fecal incontinence only and those who were continent as well as the use of a large, nation-wide sample. Nelson et al.¹⁰ analyzed data of residents in nursing homes in only one state and their length of stay in the nursing home prior to the start of the study was unknown. Our study analyzed individuals from the time of their nursing home admission. Furthermore, our analysis is the first to quantify the risk that a resident would develop dual incontinence and model the time from admission to developing the incontinence. Our model also adjusted for Black race and Hispanic ethnicity of nursing home residents which builds on recent knowledge about racial and ethnic disparities in incontinence prevention and cure/resolution.^{11,12} Another strength of our study is the consideration/screening of predictors of dual incontinence not only at the resident level but at the nursing home and community levels. Many of our predictors were defined using multi-item scales which has been shown to promote accuracy of statistical models, including those using MDS records,²⁸ in part by taking advantage of the comprehensive data available in the data sets.

Findings by our team¹¹ show that preventing incontinence in older nursing home admissions who are continent is uncommon, occurring in only 12%. Nursing homes in this study had staffing levels that met federal guidelines²⁹ and were in the upper tier of quality based on

percentage of residents receiving Medicaid.¹⁴ As there are few studies examining interventions aimed at preventing the development of dual incontinence, the findings of this study serve an important purpose in supporting and guiding innovative approaches for prevention and promoting directing future studies of their effectiveness.

Conclusion

This study shows that dual incontinence is a common problem that older individuals develop after nursing home admission. Results highlight the need for greater efforts towards prevention of incontinence. Significant risk factors of dual incontinence in this study provide some of the strongest evidence to date to focus interventions on residents with urinary incontinence, to improve or maintain functional ability, or to assist with toileting in residents with cognitive deficits.

Acknowledgments

This study was funded by National Institute of Nursing Research, NIH, 1R01NR010731 and the Minnesota Supercomputing Institute, University of Minnesota, Minneapolis, MN.

References

1. Bliss DZ, Harms S, Garrard JM, et al. Prevalence of incontinence by race and ethnicity of older people admitted to nursing homes. *J Am Med Dir Assoc*. 2013; 14:451.e1–451.e7. [PubMed: 23623144]
2. Chiang L, Ouslander J, Schnelle J, Reuben DB. Dually incontinent nursing home residents: Clinical characteristics and treatment differences. *J Am Geriatr Soc*. 2000; 48:673–676. [PubMed: 10855605]
3. Gorina Y, Schappert S, Bercovitz A, Elgaddal N, Kramarow E. Prevalence of incontinence among older americans. *Vital Health Stat* 3. 2014; 36:1–33.
4. Saga S, Vinsnes AG, Morkved S, Norton C, Seim A. What characteristics predispose to continence in nursing home residents? A population-based cross-sectional study. *Neurourol Urodyn*. 2015; 34:362–367. [PubMed: 24470319]
5. Shih YT, Hartzema AG, Tolleson-Rinehart S. Labor costs associated with incontinence in long-term care facilities. *Urology*. 2003; 62:442–446. [PubMed: 12946743]
6. Moore, KH., Wagner, TH., Subak, L., de Wachter, S., Dudding, T. Economics of urinary & faecal incontinence, and prolapse. In: Abrams, P.Cardozo, L.Khoury, S., Wein, A., editors. *Incontinence*. 5. The Netherlands: ICUD-EAU Publishers; 2013. p. 1829-1862.
7. Bliss DZ, Savik K, Harms S, Fan Q, Wyman JF. Prevalence and correlates of perineal dermatitis in nursing home residents. *Nurs Res*. 2006; 55:243–251. [PubMed: 16849976]
8. MacDonald CD, Butler L. Silent no more: Elderly women's stories of living with urinary incontinence in long-term care. *J Gerontol Nurs*. 2007; 33:14–20.
9. Schussler S, Dassen T, Lohrmann C. Care dependency and nursing care problems in nursing home residents with and without dementia: A cross-sectional study. *Aging Clin Exp Res*. 2016; 28:973–982. [PubMed: 25527067]
10. Nelson RL, Furner SE. Risk factors for the development of fecal and urinary incontinence in Wisconsin nursing home residents. *Maturitas*. 2005; 52:26–31. [PubMed: 16143223]
11. XXX [removed for blinding]
12. XXXX [removed for blinding]
13. Diez-Roux AV. Bringing context back into epidemiology: Variables and fallacies in multilevel analysis. *Am J Public Health*. 1998; 88:216–222. [PubMed: 9491010]

14. Mor V, Zinn J, Angelelli J, Teno JM, Miller SC. Driven to tiers: Socioeconomic and racial disparities in the quality of nursing home care. *Milbank Q.* 2004; 82:227–256. [PubMed: 15225329]
15. Porell FW, Miltiades HB. Regional differences in functional status among the aged. *Soc Sci Med.* 2002; 54:1181–1198. [PubMed: 11989956]
16. Phillips CD, Hawes C, Mor V, Fries BE, Morris JN, Nennstiel ME. Facility and area variation affecting the use of physical restraints in nursing homes. *Med Care.* 1996; 34:1149–1162. [PubMed: 8911430]
17. XXXX [removed for blinding]
18. XXXX [removed for blinding]
19. Moore, K., Dumoulin, C., Bradley, C., et al. Adult conservative management. In: Abrams, P.Cardozo, L.Khoury, S., Wein, A., editors. *Incontinence. 5. The Netherlands: ICUD-EAU Publishers; 2013. p. 1101-1228.*
20. Fink HA, Taylor BC, Tacklind JW, Rutks IR, Wilt TJ. Treatment interventions in nursing home residents with urinary incontinence: A systematic review of randomized trials. 2008; 83:1332–1343.
21. Schnelle JF, Leung FW, Rao SS, et al. A controlled trial of an intervention to improve urinary and fecal incontinence and constipation. *J Am Geriatr Soc.* 2010; 58(8):1504–1511. [PubMed: 20653804]
22. Ouslander JG. Effects of prompted voiding on fecal continence among nursing home residents. *J Am Geriatr Soc.* 1996; 44:424–428. [PubMed: 8636590]
23. Wagg, AS., Chen, LK., Kirschner-Hermanns, R., Kuchel, GA., Johnson, T., Ostraskiewicz, J., Markland, A., Palmer, MH., Szonyi, G. Incontinence in the Frail Elderly. In: Abrams, P.Cardozo, L.Khoury, S., Wein, A., editors. *Incontinence. 5. The Netherlands: ICUD-EAU Publishers; 2013. p. 1003-1099.*
24. Su M-Y, Lin S-Q, Zhuo Y-W, Liu S-Y, Lin A, Lin X-R. A prospective, randomized, controlled study of a suspension positioning system used with elderly bedridden patients with neurogenic fecal incontinence. *Ostomy Wound Manage.* 2015; 61:30–39.
25. Krichbaum K, Pearson V, Savik K, Mueller C. Improving resident outcomes with GAPN organization level interventions. *Gerontological advanced practice nurses. Western J Nurs Res.* 2005; 27:322–337.
26. Blekken LE, Vinsnes AG, Gjeilo KH, et al. Effect of a multifaceted educational program for care staff concerning fecal incontinence in nursing home patients: Study protocol of a cluster randomized controlled trial. *Trials.* 2015; 16:69. [PubMed: 25887238]
27. Centers for Medicare & Medicaid Services. Nursing home data compendium 2015 edition. http://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/CertificationandCompliance/downloads/nursinghomedatacompendium_508.pdf. Updated 2015
28. Teigland, C., Gardiner, R., Li, H., Byrne, C. Clinical informatics and its usefulness for assessing risk and preventing falls and pressure ulcers in nursing home environments. In: Henriksen, K.Battles, JB.Marks, ES., Lewin, DI., editors. *Advances in patient safety: From research to implementation (Vol 3: Implementation issues).* Rockville (MD): 2005. NBK20539
29. Harrington, C. Nursing home staffing standards. Kaiser commission on medicaid and the uninsured. https://www.justice.gov/sites/default/files/elderjustice/legacy/2015/07/12/Kaiser_Commission_Report_on_Nursing_Home_Staffing_Standards.pdf. Updated June 2002

Figure 1.
The proportion of nursing home residents who remained free of dual incontinence during their nursing home stay over time is shown.

Table 1

Physical and Functional Characteristics of Older Nursing Home Admissions Followed for Developing Dual Incontinence

Variable/Scale	MDS Item	Admissions n = 39,181
Physical and Function/Mobility		mean (sd)
Activities of Daily Living Limitation Score ^a	G1aA, G1bA, G1eA, G1gA, G1hA, G1iA, G1jA, Range 0–28	11.33 (6.52)
Body Mass Index	K2a–b	25.48 (5.17)
Comorbidities <i>Charlson Index</i> ^b	I3a–e, and/or I1, Range 0–30	1.77 (1.54)
Medications Number per week	O4a–e, Range 0–35	6.62 (6.08)
Mortality risk <i>CHESS Score</i> ^c	J1c, J1g, J1i, J1o, K3a, K4c, J5c, B6, G9, Range 0–5	1.65 (1.06)
		% (n)
Incontinence		
Urinary only	H1a	20.5 (8,045)
Fecal only	H1b	2.2 (845)
Oxygenation Problems <i>Number of Indicators</i>	J1b, J1k–l, P1ag, P1ai–j, P1al, P1bdA	
1		11.3 (4,417)
2		7.3 (2,879)
3		5.3 (2,069)
Perfusion Problems <i>Number of Indicators</i>	J1a, J1c–d, J1g	
1		27.9 (10,921)
2		2.6 (1,031)
Poor Nutrition <i>Number of Indicators</i>	K3a, K4c	
1		39.0 (15,281)
2		6.4 (2,497)
Restraint Use - Any	P4c–e	1.4 (546)
Tube Feeding	K5b	1.5 (585)
Vision Impairment <i>Number of Indicators</i>	D1, D2a, D2b	
1		22.2 (8,698)
2		7.0 (2,727)
3		4.3 (1,677)

^aMorris JN, Fries BE, Morris SA. Scaling ADLs within the MDS. *J Gerontol A Biol Sci Med Sci.* 1999;54:M546–M553

^bCharlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *J Chronic Dis.* 1987;40:373–383

^cHirdes JP, Frijters DH, Teare GF. The MDS-CHESS scale: A new measure to predict mortality in institutionalized older people. *J Am Geriatr Soc.* 2003;51:96–100

Table 2

Cognitive and Emotional Characteristics of Older Nursing Home Admissions Followed for Developing Dual Incontinence

Variable/Scale	MDS Item	Admissions n = 39,181
	Cognition/Emotion	mean (sd)
Cognitive deficits <i>MDS-COGS</i> ^a Score	B2a, B2b, B3b, B3d, B3e, B4, C4, G1gA, Range 0–10	2.22 (2.37)
Communication Difficulties Score	C1, C5, C6, C3b–f, Range 0–9	0.89 (1.2)
Discomfort Behavior Scale ^b Score	E1c, E1k, E1l–p, E4a–eA, E4a–eB, Range 0–102	3.65 (7.83)
		n (%)
Delirium <i>MDS-CAM</i> ^c score	B5a–f, B6, E5	
Subsyndromal Delirium Level 1		13.1 (5,114)
Subsyndromal Delirium Level 2 or Full Delirium		8.5 (3,328)
Depression ^d – Any	E1a, E1d, E1f, E1h, E1i, E1l, E1m	28.3 (11,084)

^aHartmaier SL, Sloane PD, Guess HA, Koch GG. The MDS cognition scale: A valid instrument for identifying and staging nursing home residents with dementia using the minimum data set. *J Am Geriatr Soc.* 1994;42:1173–1179

^bStevenson KM, Brown RL, Dahl JL, Ward SE, Brown MS. The discomfort behavior scale: A measure of discomfort in the cognitively impaired based on the minimum data set 2.0. *Res Nurs Health.* 2006;29:576–587

^cDosa D, Intrator O, McNicoll L, Cang Y, Teno J. Preliminary derivation of a nursing home confusion assessment method based on data from the minimum data set. *J Am Geriatr Soc.* 2007;55:1099–1105

^dBurrows AB, Morris JN, Simon SE, Hirdes JP, Phillips C. Development of a Minimum Data Set-based depression rating scale for use in nursing homes. *Age Ageing.* 2000;29:165–172

Table 3

Characteristics of Nursing Homes and Their Surroundings

Characteristics of the Census Tract	n (%) of Nursing Homes in Census Tract Communities						
	Whites Not Hispanic	Hispanic	Black Not Hispanic	American Indian, Asian, Pacific Islander ¹	In an Urban Area	Working Class	Below Poverty
75%	314 (70.6) ²	3 (0.7)	7 (1.6)	2 (0.5)	221 (49.7)	66 (14.8)	0 (0.0)
50 to < 75%	74 (16.6)	8 (1.8)	17 (3.8)	0 (0.0)	13 (2.9)	331 (74.4)	2 (0.5)
25 to < 50%	41 (9.2)	28 (6.3)	34 (7.6)	9 (2.0)	1 (0.2)	46 (10.3)	37 (8.3)
< 25%	16 (3.6)	406 (91.2)	387 (87.0)	432 (97.5)	210 (47.2)	2 (0.5)	406 (91.2)

¹ Racial and ethnic categories are according to U.S. Census;

² as an example, 70.6% (n=314) of nursing homes in our sample were located in Census tract communities with 75% White not Hispanic population

Table 4

Predictors of Time to Dual Incontinence in Older Nursing Home Admissions

Predictors	Hazard Ratio	95% Confidence Interval
Individual Level		
Age	1.010	1.007–1.013
Activities of Daily Living Limitation Score ^a	1.060	1.056–1.063
Comorbidities (Charlson Index ^b)	1.080	1.066–1.095
Cognitive Deficits (MDS-COGS Score ^c)	1.182	1.164–1.199
Black Race *	1.051	0.973–1.134
Hispanic Ethnicity *	0.999	0.847–1.180
Only Urinary Incontinence **	1.309	1.250–1.371
Only Fecal Incontinence **	1.062	0.925–1.218
Nursing Home Level		
Percentage of Residents on Medicaid	1.001	1.000–1.002
Nursing Home Deficiency/Quality of Care Index	1.005	1.001–1.009

* Reference group is being White Not Hispanic, Asian/Pacific Islander or American Indian/Native Alaskan;

** Reference group is being continent

^aMorris JN, Fries BE, Morris SA. Scaling ADLs within the MDS. *J Gerontol A Biol Sci Med Sci.* 1999;54:M546–M553

^bCharlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *J Chronic Dis.* 1987;40:373–383

^cHartmaier SL, Sloane PD, Guess HA, Koch GG. The MDS cognition scale: A valid instrument for identifying and staging nursing home residents with dementia using the minimum data set. *J Am Geriatr Soc.* 1994;42:1173–1179