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Stability of Cardiopulmonary Resuscitation and Do Not Resuscitate Orders among Long-Term Nursing Home Residents

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Abstract

Background—High quality care for long-term nursing home residents should include discussions and follow-up on patients' end-of-life care wishes. Yet, recent changes to the Minimum Data Set (MDS) data collection exclude this information from routine assessment of patients mandated by the Centers for Medicare & Medicaid Services (CMS), making the provision of high quality end-of-life care less likely. We examined the stability of cardiopulmonary resuscitation (CPR) and do-not-resuscitate (DNR) orders to offer guidance to policy and care practice developments.

Methods—We examined changes in DNR status of a national long-term care nursing home cohort, following them for 5 years after admission. A competing risk model was estimated to identify covariates predicting changes from CPR to DNR status and vice versa.

Results—About half the cohort chose DNR at admission and did not change its status. Of those who entered with CPR status, 40% changed to DNR. The most important factors influencing change were hospitalizations and nursing home transfers, **followed by race and ethnicity with black race (relative to white) in particular having the largest effect on change.** Other individual and nursing home characteristics influenced the likelihood of changing from CPR to DNR as well.

Conclusions—Long-term nursing home patients who enter with full code CPR have a high probability of changing their status to DNR during their stay. High quality care should offer them the opportunity to revisit their choice periodically, documenting changes in end-of-life choices when they occur, thus ensuring that care will match patients' wishes. As the MDS plays a prominent role in patients' care, CMS should consider reinstating information about advance directive in it.

Keywords

End-of-life; advance directives; nursing homes; competing risk models

INTRODUCTION

There is a large body of literature examining the prevalence of advance directives in general, and do-not-resuscitate (DNR) orders in particular, in nursing homes,[1–5] and the factors that influence patients' choice of these orders,[6–9] including the way patients are asked about their DNR preferences.[10] There are also studies examining the extent to which physicians discuss these issues with patients and families, and the degree to which nursing home staff follow patient preferences.[11] Many of the studies to-date focus on hospitals and acute care setting,[12,13] and may or may not generalize to nursing homes. Our literature review found only one study addressing the question of preference stability.[14] This investigation, part of the seminal SUPPORT study, focusing also on hospitalized patients, examined stability of cardiopulmonary resuscitation (CPR) preferences over a 2 month period among 1,590 seriously ill patients. 73% of these patients chose CPR at baseline and 70% chose CPR 2 months later. 80% had stable preferences over the period. Of those initially choosing CPR, 85% indicated the same preference at 2 months, and of those choosing DNR initially 69% had the same preference at 2 months.

Long-term nursing home patients are likely to be different from patients in acute care hospitals. They are more likely to have comorbidities, both physical and mental, which have been shown to influence choice of DNR.[4,6] Furthermore, their stay is longer, averaging 940 days (authors' calculations from the Minimum Data Set for long-term patients). During this period, their health status can change, influencing their choice. A relatively long length-of-stay also offers more opportunities for interaction with medical care professionals who may discuss end-of-life options with the patient and family, potentially leading to changes in treatment choice. Therefore, a priori it is unclear how stable resuscitation choices in this setting are.

To examine this issue we present an analysis of resuscitation choices made by a national cohort of long-term nursing home residents.

METHODS

Sample and data

We obtained national Minimum Data Set (MDS) records for all long-term nursing home residents admitted to Medicare and Medicaid certified facilities in 2003 and followed them through the end of 2007 until death. The MDS is a federally mandated, individual level data-set with information about all nursing home residents collected at regular intervals. It includes data about the person's socio-demographics, physical and mental health status, and treatments. It also records residents' DNR status at admission, once a year during an annual assessment, and whenever residents' health status changes significantly. These data are submitted to the Centers for Medicare and Medicaid Services (CMS) which uses them to calculate Medicare payment rates and the quality measures for Nursing Home Compare.[15] Although the evidence of reliability and validity of the MDS indicators has been variable [16–18] many of those used in this study, e.g., the activities of daily living and cognitive performance scale, have been shown to have adequate to good psychometric properties. [19,20,21–24] The MDS data was augmented with information about facility characteristics for 2003 obtained from the Long-Term-Care Focus web site.[25]

The initial sample included 144,189 long-stay patients, defined as those with a payer other than Medicare upon admission. This definition excludes the 101,936 who entered as Medicare, post-acute and converted to long-term care at some point, as indicated by stays longer than 90 days. It also excludes 78,606 who entered prior to 2003 and for whom we do not observe the choice of advance directive. 9,225 were excluded from the initial sample

because they had duplicate records with partially different data, 222 were excluded because their date of death was before their last assessment date, and 2,652 were excluded because of missing socio-demographic or health status data. 13,843 observations were removed because they were missing facility level data. The final sample included 118,247 residents, or 82% of the initial sample of 144,189.

Variables and analytical file construction

The records for each individual were linked longitudinally using the individual identifier to create a survival data set with multiple-records-per-resident, where each observation records a span of time (t1, t2] from one MDS assessment to the next. The time-varying covariates like mental and physical status as well as CPR/DNR status were assumed to be constant during the span but could change at the end of the interval.

Our choice of covariates to predict changes in code status was guided by those found in previous studies to be associated with DNR orders, including patient-level variables, facility characteristics, and states' fixed effects.[4,6,8,11] We included variables describing the patients' socio-demographics and health status, and hospital and nursing home transfers during each period. Facility characteristics described ownership, payer mix, staffing levels, bed size, occupancy, and average case mix. States were introduced as fixed effects to account for variation in policies that may influence nursing homes' practice patterns in general and advance care planning in particular. Variables definitions are provided in Table 1.

Analyses

We examined the prevalence of DNR status at admission and patterns of change during the stay. Because over 95% of the changes occurred only once, we focused the multivariate analysis on the first change. We modeled the change for those entering with CPR and choosing to change to DNR and vice versa. As a sensitivity analysis we also modeled the change from CPR to DNR stratified by whether the patient had a diagnosis of dementia at admission, received a diagnosis of dementia sometimes during the stay, or never received a diagnosis of dementia.

We modeled this choice as a competing risks regression model[26] using Stata's stcrreg command. This model assumes that at each period those who die by the end of the period are no longer available in the next period to make a resuscitation choice. They are removed from the population denominator for the next period. Because of the high prevalence of death in this population, ignoring in the estimation the fact that death events prevent resuscitation changes from occurring is likely to introduce a bias.[27] Due to computational limits, we modeled the data on a 25 percent random sample of the national population.

RESULTS

Table 1 presents descriptive statistics for those entering with and without DNR order. Of the 118,247 individuals in our sample, 55,996 or 47.3% chose full code status CPR at admission. Compared with those who chose DNR, they were more likely to be male, younger, Black or Hispanic, and had lower educational attainment. They tended to have less comorbidities, fewer depressive symptoms, less aggressive symptoms, and were less likely to have dementia. The table also shows that the 25% random samples which were used for the multivariate analyses were very similar to the full samples.

Table 2 shows the transitions in resuscitation status. About half of long-term patients (53%) chose DNR at admission, and over 92% of them did not change this choice until death. However, of the 47% who entered with a full code, almost half – 40% - changed their status

to DNR and remained as DNR until their death. Overall, close to 70% of patients had a standing DNR order at death. Fewer than 5% of patients exhibited more than two transitions. Close inspection of these cases suggested that they were likely the result of errors; one MDS assessment recorded the advanced directive erroneously and the following assessment corrected the error (such a sequence generates 2 changes). We, therefore, chose not to model multiple transitions.

Table 3 reports the results of the competing risk models. Model 1 shows the sub hazard ratios (SHRs) for all patients admitted with CPR for each individual patient and nursing home characteristic. The state fixed effects are not shown. Males, younger people, and to a lesser degree, those with less education, were less likely to change their original choice and switch from CPR to DNR. Many of the health conditions also had an impact on the choice. By far the most important were hospitalization or nursing home transfer with SHRs of 1.98 and 2.53 respectively. These events probably indicate both an acute change in health status as well as an opportunity to reconsider resuscitation status. Other conditions which increased the likelihood of changing from CPR to DNR were a higher cognitive impairment, dementia or Alzheimer's diagnosis, and to a lesser degree, depression. A higher number of comorbidities or activities-of-daily-living, pressure ulcers, and higher levels of pain, all lowered the likelihood of changing from CPR to DNR. Receipt of treatments such as chemotherapy, ventilator, or renal dialysis had no impact on these decisions.

Residents in for-profit facilities, hospital based nursing homes, and institutions with a higher percent of Medicaid patients and higher average case mix were less likely to change from CPR to DNR after admission. Staffing patterns also affected these SHRs. Patients residing in nursing homes with more physician extenders, such as physician assistants, and those providing more registered nurse (RNs) hours per resident day were more likely to change from CPR to DNR. However, more certified nurse assistants (CNAs) and a higher ratio of RNs to all nursing lowered the SHRs.

Models 1A-1C stratify the above sample by dementia status: diagnosis of dementia upon admission, diagnosis sometime during the stay, or never. The SHR are very similar to the full model (model 1) in terms of direction and magnitude of the coefficients, although they do not always reach statistical significance. The two noteworthy exceptions are: age, which was a highly significant factor for the full sample, was not a factor for those entering with dementia; and the percent Medicare patients in the facility, which was not significant for the sample as a whole, lowered the SHR substantially (0.646) for those diagnosed with dementia upon admission.

Model 2 predicts the change from DNR at admission to CPR, for the small (3.5%) proportion that chose to do so. Most predictors are in the opposite direction to those in model 1, as expected. Of particular note is the very strong effect of nursing home transfers with SHR exceeding 14, suggesting that this might be the dominant circumstance leading to this change. This unusual result persisted when we estimated the model over additional random samples. Also relatively high is the percent Medicare patients in the facility with an SHR of 2.3.

DISCUSSION

In this study we examined the stability of end-of life treatment choice made by long-term care nursing home residents. We followed a national cohort over a five year period from admission until death. About half chose DNR status at admission. Very few of these patients (3.5%) reversed their choice, mostly due to a nursing home transfer. Of those who preferred full code at admission, approximately half changed their choice to DNR during their stay.

Such a change might have been motivated by changes in health status, and appears to have been most often triggered by either a hospital admission or a transfer to another nursing home. Our findings suggest that end-of-life choices cannot be assumed to be stable in this population and high quality end-of-life care, which ought to be patient centered, sensitive and responsive to patient and family preferences, should include periodic updates of end-of-life preferences.

Recently the CMS implemented a new version of the MDS. The MDS, when designed originally as part of the Resident Assessment Instrument (RAI), was intended as a care planning tool.[28] It was anticipated that it would enhance the communication between staff, patients, and families, and facilitate an understanding of their preferences, as well as documenting it, all with the expectation of improvements in care.[28] One of the changes associated with moving from the MDS Version 2 to Version 3 was to drop the requirement to collect information about advance directives, including resuscitation preferences. The rationale offered by the panel recommending the change was that there were inconsistencies between the MDS and the medical record and that there was no evidence that having this information in the MDS contributes to better compliance with patient wishes.[29] However, it should be noted that no studies have been performed to determine if the MDS information about DNR is inaccurate or has no impact on care. Without the requirement to record DNR information in the MDS it is unclear how often nursing home staff will inquire about advance directive preferences. The findings we present here indicate that it is not sufficient to identify end-of-life treatment preferences at admission. Periodic updating is important to allow patient preferences to be known and honored. The data quality problems in collecting DNR data should be addressed to allow this important component of patient preferences to be a major part of the patient assessment and care plan.

We also found that not all patients are equally likely to change their preferences. Gender, culture as proxied by race/ethnicity, and education, all play an important role, above and beyond the physical and mental status of the patient. In fact the SHRs for race/ethnicity are much larger than the SHRs for most of the diagnoses and treatments, and even age categories. These findings are not surprising, and mirror the demographics of DNR choice in general. They do suggest, however, that discussions about end-of-life care, and opportunities for patients and families to revisit these decisions during the nursing home stay should be culturally sensitive. Indeed, the relatively large SHRs we found for physician extenders and RN hours per resident day indicate that staff plays an important role in influencing patients' decisions to change from CPR to DNR, as one might expect. These data do not allow us to determine what role staff plays in these decisions, whether it is primarily limited to offering information and facilitating patients' decisions, as proper care would dictate, or whether staff also influences preferences, as some in recent political debates have alluded to.[30,31]

We should also note that, as all studies of this type, our study is limited by the accuracy of the risk adjustment variables available in the MDS. And, as discussed before, while many of the MDS variables have been shown to be valid and reliable, others, such as those measuring depression and behavior, especially for patients with dementia, may be less accurate.

Conversations about end-of-life choices, even though they are an essential part of high-quality-care, are not easy for medical professionals to initiate. As Lamas and Rosenbaum point out, most physicians lack the training and are not comfortable in guiding their patients through this choice process.[32] In nursing homes this task often falls to nurses and physician extenders, who also do not have the training needed to help patients and their families in making these decisions.[33] And yet this is an important issue which affects all long-term patients, and as our data show, many of them do change their preferences as they go through their "nursing home journey". Nursing homes should be better prepared to support their

residents in making these decisions. End-of life discussions should become part of routine high quality care. One way in which CMS can encourage this is by bringing this information back into the MDS tool, formalizing and legitimizing its inclusion as part of the plan-of-care conversation.

References

1. Ryden MB, Brand K, Weber E, Oh HL, Gross C. Nursing home resuscitation policies and practices for residents without DNR orders. Geriatric nursing (New York, NY). Nov-Dec;1998 19(6):315–319. quiz 320–311.
2. Kaplan BJ, Levenson S. Palliative Care: Back to Basics of Prognosis, Symptom Management, Rights & Responsibilities. Caring for the Ages. 2002; 3(7) https://www.amda.com/publications/caring/july2002/eol_practitioners.cfm.
3. Lindner SA, Davoren JB, Vollmer A, Williams B, Landefeld CS. An electronic medical record intervention increased nursing home advance directive orders and documentation. J Am Geriatr Soc. Jul; 2007 55(7):1001–1006. [PubMed: 17608871]
4. Batchelor AJ, Winsemius D, O'Connor PJ, Wetle T. Predictors of advance directive restrictiveness and compliance with institutional policy in a long-term-care facility. J Am Geriatr Soc. Jul; 1992 40(7):679–684. [PubMed: 1607583]
5. Zweig SC, Kruse RL, Binder EF, Szafara KL, Mehr DR. Effect of do-not-resuscitate orders on hospitalization of nursing home residents evaluated for lower respiratory infections. J Am Geriatr Soc. Jan; 2004 52(1):51–58. [PubMed: 14687315]
6. Castle NG, Mor V. Advance care planning in nursing homes: pre- and post-Patient Self-Determination Act. Health Serv Res. Apr; 1998 33(1):101–124. [PubMed: 9566180]
7. Ghusn HF, Teasdale TA, Jordan D. Continuity of do-not resuscitate orders between hospital and nursing home settings. J Am Geriatr Soc. Apr; 1997 45(4):465–469. [PubMed: 9100716]
8. Teno JM, Branco KJ, Mor V, et al. Changes in advance care planning in nursing homes before and after the patient Self-Determination Act: report of a 10-state survey. J Am Geriatr Soc. Aug; 1997 45(8):939–944. [PubMed: 9256845]
9. Levy CR, Fish R, Kramer A. Do-not-resuscitate and do-not-hospitalize directives of persons admitted to skilled nursing facilities under the Medicare benefit. J Am Geriatr Soc. Dec; 2005 53(12):2060–2068. [PubMed: 16398888]
10. Percy ME, Llewellyn-Thomas H. Assessing preferences about the DNR order: does it depend on how you ask? Med Decis Making. Jul-Sep;1995 15(3):209–216. [PubMed: 7564934]
11. Levin JR, Wenger NS, Ouslander JG, et al. Life-sustaining treatment decisions for nursing home residents: who discusses, who decides and what is decided? J Am Geriatr Soc. Jan; 1999 47(1):82–87. [PubMed: 9920234]
12. Hakim RB, Teno JM, Harrell FE Jr, et al. Factors associated with do-not-resuscitate orders: patients' preferences, prognoses, and physicians' judgments. SUPPORT Investigators. Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment. Ann Intern Med. Aug 15; 1996 125(4):284–293. [PubMed: 8678391]
13. Teno J, Lynn J, Wenger N, et al. Advance directives for seriously ill hospitalized patients: effectiveness with the patient self-determination act and the SUPPORT intervention. SUPPORT Investigators. Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment. J Am Geriatr Soc. Apr; 1997 45(4):500–507. [PubMed: 9100721]
14. Rosenfeld KE, Wenger NS, Phillips RS, et al. Factors associated with change in resuscitation preference of seriously ill patients. The SUPPORT Investigators. Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments. Arch Intern Med. Jul 22; 1996 156(14):1558–1564. [PubMed: 8687264]
15. Harris Y, Clauser SB. Achieving improvement through nursing home quality measurement. Health Care Financ Rev. Summer;2002 23(4):5–18. [PubMed: 12500467]
16. Phillips CD, Chu CW, Morris JN, Hawes C. Effects of cognitive impairment on the reliability of geriatric assessments in nursing homes. J Am Geriatr Soc. Feb; 1993 41(2):136–142. [PubMed: 8426035]

17. Schnelle JF, Wood S, Schnelle ER, Simmons SF. Measurement sensitivity and the Minimum Data Set depression quality indicator. Gerontologist. Jun; 2001 41(3):401–405. [PubMed: 11405438]

18. Anderson RL, Buckwalter KC, Buchanan RJ, Maas ML, Imhof SL. Validity and reliability of the Minimum Data Set Depression Rating Scale (MDSDRS) for older adults in nursing homes. Age Ageing. Jul; 2003 32(4):435–438. [PubMed: 12851189]

19. Phillips CD, Morris JN. The potential for using administrative and clinical data to analyze outcomes for the cognitively impaired: an assessment of the minimum data set for nursing homes. Alzheimer disease and associated disorders. 1997; 11 (Suppl 6):162–167. [PubMed: 9437461]

20. Hawes C, Morris JN, Phillips CD, Mor V, Fries BE, Nonemaker S. Reliability estimates for the Minimum Data Set for nursing home resident assessment and care screening (MDS). Gerontologist. 1995; 35(2):172–178. [PubMed: 7750773]

21. Mor V, Angelelli J, Jones R, Roy J, Moore T, Morris J. Inter-rater reliability of nursing home quality indicators in the U.S. BMC Health Serv Res. Nov.2003 3(1):20. [PubMed: 14596684]

22. Morris JN, Hawes C, Fries BE, et al. Designing the National Resident Assessment Instrument for Nursing Homes. The Gerontologist. 1990; 30:293. [PubMed: 2354790]

23. Lawton MP, Casten R, Parmelee PA, Van Haitsma K, Corn J, Kleban MH. Psychometric characteristics of the minimum data set II: validity. J Am Geriatr Soc. Jun; 1998 46(6):736–744. [PubMed: 9625190]

24. Mor V, Intrator O, Unruh MA, Cai S. Temporal and Geographic variation in the validity and internal consistency of the Nursing Home Resident Assessment Minimum Data Set 2.0. BMC Health Serv Res. 2011; 11:78. [PubMed: 21496257]

25. Brown University. [Accessed June 6, 2012] LTCFocUS.org. http://ltcfocus.org/default.aspx

26. Fine JP, Gray RJ. A Proportional Hazards Model for the Subdistribution of a Competing Risk. Journal of the American Statistical Association. Jun 01; 1999 94(446):496–509.

27. Berry SD, Ngo L, Samelson EJ, Kiel DP. Competing risk of death: an important consideration in studies of older adults. J Am Geriatr Soc. Apr; 2010 58(4):783–787. [PubMed: 20345862]

28. Centers for Medicare & Medicaid Services. [Accessed January 21, 2013] Revised Long-Term Care Facility Resident Assessment Instrument User's Manual Verion 2.0. 2008. http://www.hpm.umn.edu/nhregsplus/Resources%20and%20Publications/Federal_Resources/RAI/Complete%20RAI.pdf

29. Saliba, D.; Buchanan, J. [Accessed January 21, 2013] Development and Validation of a Revised Nursing Home Assessment Tool: MDS 3.0. 2008. http://www.cms.gov/NursingHomeQualityInits/Downloads/MDS30FinalReport.pdf

30. Pear R. Obama Returns to End-of-Life Plan That Caused Stir. The New York Times. Dec 25.2010

31. The Washington Times. EDITORIAL: The return of the death panels - Medicare cuts may put the Obama campaign on life support. The Washington Times. Aug 20.2010

32. Lamas D, Rosenbaum L. Freedom from the tyranny of choice--teaching the end-of-life conversation. N Engl J Med. May 3; 2012 366(18):1655–1657. [PubMed: 22551124]

33. Temkin-Greener H, Zheng N, Norton S, Quill T, Ladwig S, Veazie P. Measuring End-of-Life Care Processes in Nursing Homes. The Gerontologist. Dec; 2009 49(6):803–815. [PMC2775900]. [PubMed: 19574538]

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TABLE 1

Demographic and clinical characteristics of residents and the nursing homes they reside in for a new admission cohort of nursing home residents with Cardiopulmonary Resuscitation (CPR) and Do Not Resuscitate (DNR) Orders

	Admitted with CPR N = 55,996		**Admitted with DNR(1) N = 62,251**		**25% random sample of those admitted with CPR(2) N = 13,999**		**25% random sample of those admitted with DNR(3) N = 15,562**	
Individual Characteristics:	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Male	21,040	38	20,821	33	5,116	37	5,267	34
Age								
< 65	4,083	7	1,886	3	1,061	8	477	3
65 – 74	7,400	13	5,690	9	1,844	13	1,395	9
75 – 84	21,264	38	21,542	35	5,293	38	5,403	35
>= 85	23,249	42	33,133	53	5,801	41	8,287	53
Highest level of schooling completed								
Grade 11 or less, including no schooling	20,708	37	21,618	35	5,098	36	5,405	35
High school diploma	22,089	39	24,436	39	5,574	40	6,095	39
Some college, technical school, college degree or higher	12,300	22	15,479	25	3,077	22	3,892	25
Unknown	899	2	718	1	250	2	170	1
Married	16,554	30	17,069	27	4,059	29	4,282	28
Race								
White	47,263	84	58,489	94	11,757	84	14,629	94
Black	5,985	11	2,066	3	1,570	11	495	3
Hispanic	1,855	3	1,050	2	457	3	281	2
Other	893	2	646	1	215	2	157	1
Clinical Characteristics at Admission:								
Moderate pain daily or severe pain within the last seven days	9,064	16	11,218	18	2,229	16	2,826	18
At least stage 2 pressure ulcer present	8,588	15	9,097	15	2,131	15	2,282	15
Chemotherapy treatment	394	1	372	1	111	1	79	1
Renal dialysis treatment	1,106	2	506	1	281	2	137	1
Ventilator	293	1	128	< 1	75	1	36	< 1
Clinical Characteristics at Admission:	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**

	Admitted with CPR N = 55,996		Admitted with DNR(1) N = 62,251		25% random sample of those admitted with CPR(2) N = 13,999		25% random sample of those admitted with DNR(3) N = 15,562	
DX of dementia or Alzheimer's disease	25,421	45	31,487	51	6,441	46	7,926	51
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
MDS Cognitive Performance Scale(4) (4)Range: 1–7, where larger score indicates more impairment	3.26	1.65	3.59	1.67	3.26	1.65	3.60	1.66
Depression: Sum of MDS items in section E1 Range: 0–32, where a larger score indicates more depression	1.48	2.55	1.86	2.87	1.50	2.55	1.88	2.85
Aggressive behavior scale: Sum of MDS Behavioral symptom frequency items (E4BA, E4CA, E4DA, E4EA) Range: 0–12, where larger score indicates more aggressive	0.58	1.46	0.70	1.60	0.58	1.47	0.71	1.61
# of co-morbidities: Sum of 41 MDS items in Section I1 with the exception of Alzheimer's disease and dementia Range: 0–18	3.83	2.19	3.99	2.24	3.80	2.16	4.01	2.25
# of activities of daily living limitations: Sum of MDS items in section G1A Range: 0–40 where larger score indicates more impairment	17.07	9.31	18.15	9.22	17.14	9.29	18.18	9.23
Hospitalization(5) Range: 0–20	0.66	1.07	0.55	0.96	0.66	1.08	0.55	0.98
Nursing home transfer(5) Range: 0–7	0.26	0.55	0.15	0.44	0.26	0.54	0.15	0.44
Patients Admitted to Nursing Homes with the Following Characteristics:	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
For-profit	37,664	67	35,846	58	9,397	67	8,987	58
Chain affiliated	29,890	53	29,611	48	7,436	53	7,386	47
Hospital based	2,654	5	3,341	5	643	5	861	6
Nursing home has any physician extenders	16,851	30	17,178	28	4,290	31	4,215	27
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Proportion of facility residents whose primary support is Medicaid Range: 0–1	0.63	0.22	0.60	0.21	0.62	0.22	0.60	0.21
Proportion of facility residents whose primary support is Medicare Range: 0–1	0.12	0.12	0.10	0.11	0.12	0.12	0.10	0.11
Average facility RUGs case-mix index Range: 0.46–1.51	0.82	0.09	0.81	0.08	0.82	0.09	0.81	0.08
Occupancy rate Range: 0.04–1	0.87	0.12	0.88	0.11	0.87	0.12	0.88	0.12
Total # of beds	147	98	130	85	147	97	129	84

	Admitted with CPR N = 55,996		Admitted with DNR(1) N = 62,251		25% random sample of those admitted with CPR(2) N = 13,999		25% random sample of those admitted with DNR(3) N = 15,562	
Range: 4–1389								
CNA hours per resident day Range: 0.06–22.61	2.22	0.80	2.24	0.80	2.22	0.85	2.25	0.87
LPN hours per resident day Range: 0–12.57	0.73	0.37	0.69	0.33	0.73	0.37	0.70	0.33
RN hours per resident day Range: 0–8.45	0.35	0.35	0.35	0.32	0.35	0.36	0.35	0.34
Ratio of RNs to all nurses Range: 0–1	0.31	0.19	0.33	0.19	0.31	0.19	0.32	0.19

(1) In comparing the DNR 25% sample to DNR full sample, only male and black are significantly different at .05

(2) In comparing the CPR 25% sample to CPR, there are no significant differences.

(3) In comparing the DNR group to the admitted with CPR, the only differences that are NOT significant are for the proportion of residents with a high school diploma and RN hours per resident day.

(4) Morris JN, Fries BE, Mehr DR, et al. MDS Cognitive Performance Scale. *Journal of Gerontology.* 1994;49(4):M174-M183.

(5) Summarized as total number of events over the study period.

TABLE 2

NUMBER OF CHANGES IN CPR AND DNR STATUS FOLLOWING ADMISSION

Number of changes≠	CPR at admission		DNR at admission	
	N	%	N	%
0	31,036	55.43	57,372	92.16
1	22,541	40.25	2,179	3.50
2	1,196	2.14	2,383	3.83
3	1,022	1.83	128	0.21
4	98	0.17	151	0.24
5	84	0.15	21	0.03
6	10	0.02	15	0.02
7	8	0.01	1	0.00
9	1	0.00	0	0.00
12	0	0.00	1	0.00
Total	**55,996**	**100.00**	**62,251**	**100.00**

≠When the number of changes is greater than 1 it means that the patient had multiple changes between CPR and DNR status. For example, if the number of changes is 4 and the patient entered as CPR, then we observed in the data the following sequence for this patient: CPR, DNR, CPR, DNR, CPR.

TABLE 3

COMPETING RISK MODELS PREDICTING FIRST CHANGE IN RESUSCITATION STATUS (25% RANDOM SAMPLES)

	Admissions With CPR Status Converting to DNR				Admissions With DNR Status Converting to CPR N = 15,562 (Model 2)
	All N = 13,999 (Model 1)	Dementia at admission N = 6,441 (Model 1A)	No dementia at any time N = 6403 (Model 1B)	No dementia at admission, but diagnosed later N = 1,155 (Model 1C)	
	SUB HAZARD RATIOS				SUB HAZARD RATIO
Individual Characteristics:					
Female≠					
Male	0.829***	0.781***	0.898**	0.825	0.942
Age>85≠					
Under 65	0.695***	0.894	0.623***	0.349***	1.937***
65–74	0.800***	0.900	0.688***	1.161	1.464***
75–84	0.947*	0.996	0.885***	1.017	1.207***
Highest Level of Schooling Completed: High School Diploma≠					
Grade 11 or Less, including no schooling	0.935**	0.952	0.930	0.816	0.986
Some college, technical school, college degree or higher	1.017	1.014	1.020	0.951	1.052
Education unknown	0.876	1.064	0.665**	0.705	0.937
Single, Widowed Divorced≠					
Married	1.041	1.056	1.027	0.989	1.061
Race: White≠					
Hispanic	0.723***	0.731***	0.658***	0.777	1.274
Black	0.583***	0.563***	0.601***	0.789	1.474***
Other	0.776**	0.829	0.754*	0.787	0.476*
Clinical Characteristics at Admission:					
Moderate pain daily or severe pain within the last 7 days	0.898***	0.881*	0.919*	0.792	0.732***
At least stage 2 pressure ulcer present	0.899***	0.901*	0.937	0.799	0.891

	Admissions With CPR Status Converting to DNR				Admissions With DNR Status Converting to CPR N = 15,562 (Model 2)
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Clinical Characteristics at Admission:					
Chemotherapy treatment	0.875	0.822	0.842	1.253	0.577
Renal dialysis treatment	0.896	0.896	0.833	1.666	1.359
Ventilator	0.955	0.377	1.358	0.925	0.200
Dx of dementia or Alzheimer's disease	1.093***	-	-	2.363***	0.948
MDS Cognitive Performance Scale	1.059***	1.057***	1.029*	1.056	0.918***
Depression	1.012**	1.015**	1.013	1.016	1.006
Aggressive behavior scale	1.003	0.994	1.017	1.023	0.986
# of co-morbidities	0.981***	0.980**	0.984*	0.939**	1.006
# of activities of daily living	0.995***	0.995**	0.993***	1.015**	0.987***
Hospitalization	1.982***	1.908***	2.092***	1.944***	1.456***
Nursing Home Transfer	2.531***	2.823***	2.573***	1.813***	14.593***
Patients Admitted to Nursing Homes with the Following Characteristics:					
For-profit	0.859***	0.852***	0.901**	0.737**	1.299***
Chain affiliated	1.043	1.039	1.049	1.120	1.038
Hospital-based	0.882*	0.782**	0.955	0.941	1.061
Physician extenders	1.061**	1.061	1.041	1.089	1.077
% Medicaid	0.738***	0.677***	0.788*	0.585	1.632**
% Medicare	1.031	0.646*	1.414	1.083	2.339**
Average RUGs	0.348***	0.680	0.210***	0.851	1.605
Occupancy rate	0.929	1.021	0.910	0.738	0.716
Total # of beds	0.999***	0.999***	0.999***	0.999	1.000
Patients Admitted to Nursing Homes with the Following Characteristics:					

	Admissions With CPR Status Converting to DNR				Admissions With DNR Status Converting to CPR N = 15,562 (Model 2)
	All N = 13,999 (Model 1)	Dementia at admission N = 6,441 (Model 1A)	No dementia at any time N = 6403 (Model 1B)	No dementia at admission, but diagnosed later N = 1,155 (Model 1C)	
CNA hours per resident day	0.952**	0.931**	0.959	1.052	1.010
LPN hours per resident day	1.016	1.104	1.004	0.741	1.046
RN hours per resident day	1.162**	1.075	1.158*	0.817	0.955
RN ratio to all nursing	0.742**	0.804	0.824	0.660	0.944

x Indicates reference category

* 0.05 = p <0.1

** 0.01 = p < 0.05

*** p < 0.01