Published in final edited form as:

J Am Med Dir Assoc. 2012 July ; 13(6): 552–557. doi:10.1016/j.jamda.2012.04.009.

Nursing Home Medical Staff Organization and 30-Day Rehospitalizations

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Abstract

Objectives—To examine the relationship between features of nursing home (NH) medical staff organization and residents' 30-day rehospitalizations.

Design—Cross-sectional study combining primary data collected from a survey of medical directors, NH resident assessment data (minimum data set), Medicare claims, and the Online Survey Certification and Reporting (OSCAR) database.

Setting—A total of 202 freestanding US nursing homes.

Participants—Medicare fee-for-service beneficiaries who were hospitalized and subsequently admitted to a study nursing home.

Measurements—Medical staff organization dimensions derived from the survey, NH residents' characteristics derived from minimum data set data, hospitalizations obtained from Part A Medicare claims, and NH characteristics from the OSCAR database and from www.Itcfocus.org. Study outcome defined within a 30-day window following an index hospitalization: rehospitalized, otherwise died, otherwise survived and not rehospitalized.

Results—Thirty-day rehospitalizations occurred for 3788 (20.3%) of the 18,680 initial hospitalizations. Death was observed for 884 (4.7%) of residents who were not rehospitalized. Adjusted by hospitalization, resident, and NH characteristics, nursing homes having a more formal appointment process for physicians were less likely to have 30-day rehospitalization ($b = -0.43$, $SE = 0.17$), whereas NHs in which a higher proportion of residents were cared for by a single physician were more likely to have rehospitalizations ($b = 0.18$, $SE = 0.08$).

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The authors have no conflicts of interest relating to this article.

Conclusion—This is the first study to show a direct relationship between features of NH medical staff organization and resident-level process of care. The relationship of a more strict appointment process and rehospitalizations might be a consequence of more formalized and dedicated medical practice with a sense of ownership and accountability. A higher volume of patients per physician does not appear to improve quality of care.

Keywords

Nursing home; medical staff organization; rehospitalizations; physicians

The size of the nursing home (NH) population is twice as large as that in acute hospitals on any given day.^{1,2} Physicians play a primary role in NHs, directing care for residents who have become increasingly frail and in need of complex medical care. Beyond the usual minimum periodic visits for patient evaluation and management, physicians are expected to be involved in diagnostic testing, consultation with specialists, ordering treatments, care planning, and decisions regarding hospitalization and end-of-life care. Further, the roles of the NH physician in psychosocial matters, particularly regarding families coping with end-of-life issues, are increasingly being recognized.^{3,4}

In theory, the relationship between physician practice and quality of medical care in the NH should be highly significant. The quality of medical care in NHs relates not to the particular work of each physician, however, but to the work of all medical staff in the NH and the way that the NH manages that care. Although limited research has been reported in this area, there are strong suggestions that physician presence in NHs has an impact on care.^{5,6} Karuza and Katz⁷ suggested that restricting practice in the NH to a limited number of physicians, either salaried or employed by the nursing facility, increases the intensity and quality of care delivered. Physicians working within such a “closed-staff model” are presumably more committed, knowledgeable of long term care practice, and physically onsite more frequently. The literature also demonstrates that nursing rates are indicators and robust predictors of quality of care,^{8,9} and are mediated in part through organizational culture.^{5,10–12} Studies examining family satisfaction with NH care, in particular end-of-life care, indicate strong concerns from family members who perceive that physicians are absent in NHs, and who have problems in communication with physicians when they do appear.^{13–15} Although limited in scope, additional case-based studies have reported a linkage between medical staff size, physician presence on-site, and decreased hospitalization rates.^{16,17}

The question remains as to whether physician supply/presence by itself is the major determinant of the impact of medical care on outcomes of care in the NH or whether there are additional factors, such as practice style and organization. Although largely absent from the NH literature, this has been studied in the acute care setting. Roemer and Friedman¹⁸ defined 7 dimensions that could describe medical organization in hospitals: staff composition, appointment process, job commitment of physicians, reporting and coordination systems, number of control committees, documentation, and informal interpersonal relationships. These organizational dimensions were related to (1) quality of care: specifically, the hospital’s performance, as measured by national accreditation; (2) aspects of the physician’s job commitment; and (3) a more tightly structured hospital staff organization. Other studies had shown a positive relationship between more standardized medical staff organization and better medical and surgical outcomes.^{19–21} Those studies also suggested that quality of care was related more to how physicians interact as a professional group and the extent of their ties to the institution than to the characteristics of the individual physicians. Thus, in this article we examine whether the quality of the medical staff interactions is related to better NH quality of care.

Modeled after Roemer and Friedman's dimensions,¹⁸ Katz and colleagues²² recently developed and validated a set of medical staff organization dimensions modified to the NH setting. They consisted of presence of a formalized appointment process, the extent of a "closed-staff model," level of physician supervision, the proportion of residents cared for on average by a single attending physician, leadership turnover, physician autonomy, physician cohesion, interdisciplinary involvement, and informal dynamics. Although these measures, taken as a whole, were shown to be relevant to various quality-of-care outcomes,²³ this study seeks to explore the relationship between specific dimensions of NH medical staff organization and outcomes that are more directly linked to physician practice.

We chose the rate of 30-day rehospitalization following an index hospitalization as our major outcome measure. Using rehospitalization as an outcome is particularly meaningful for the study of the impact of medical staff organization (MSO), as it is a product of several factors that relate to MSO. Appropriate rehospitalization control requires (1) that residents' clinical needs be met, which means that the medical staff proficiencies need to be commensurate with the ability to care for the severity of problems and that the organization of the medical staff is effectively managed; and (2) a NH's ability to pay for trained medical staff. In addition, it is a specific target for reduction within the US Patient Protection and Affordable Care Act, with penalties to hospitals beginning as early as January 2013 for 30-day readmission rates following a hospitalization for acute myocardial infarction, heart failure, or pneumonia.²⁴ We hypothesize that a more structured and cohesive MSO will be associated with better outcomes (ie, fewer rehospitalizations). We examine only the subset of dimensions developed by Katz and colleagues²² that we deemed theoretically important to rehospitalizations. Specifically, we hypothesize that a composition of staff reflective of a closed staff model, a more formal appointment process, and greater physician supervision, interdisciplinary involvement, and informal dynamics (ie, interpersonal relationships between varying types of staff) will be associated with fewer 30-day rehospitalizations.

Methods

Data Sources and Study Population

We obtained information about MSO from a random sample of medical directors selected from the American Medical Directors Association (AMDA) membership list. Survey development is described elsewhere.²² We reasoned that 200 respondents would yield a stable enough sample size to compute the psychometric properties of the scale, such as the internal consistencies, and would provide sufficient statistical power to detect significant moderately sized correlations. In May 2006, 400 AMDA members were selected randomly from the AMDA membership list in anticipation of a 50% response rate. The inclusion criteria for the respondents were the following: licensed physician and currently serving as a medical director of a freestanding, nonpediatric, licensed nursing home that was able to be matched to the Online Survey Certification and Reporting System (OSCAR). Whereas we initially achieved a 51% response rate (n = 204), the mailing list contained a number of individuals who did not meet eligibility criteria (eg, retired, nonphysician, no longer in nursing home practice). Thus, of the 204 respondents, 95 were excluded, leaving a total of 109 usable surveys. To reach the goal of 200 surveys, a second round of 400 randomly selected AMDA members was thus generated. A second mail survey was conducted in January 2007 using the same procedures as the initial survey. There were 233 surveys returned in this second wave for a response rate of 58%, with 93 respondents meeting eligibility criteria. Combining the 2 surveys resulted in a total sample of 202 usable surveys.

NH characteristics for these 202 facilities were derived from the OSCAR database from the closest certification survey to the medical director survey. We obtained information about NH residents from Medicare enrollment and claims files, the Minimum Data Set (MDS)

resident assessments, and their hospitalizations obtained from the Centers for Medicare and Medicaid Services (CMS) through a CMS Data Use Agreement (DUA). As part of this DUA process, we obtained a Waiver of Authorization for individual consent from the Institutional Review Board (IRB) at Brown University, along with overall IRB approval to conduct the research.

Using Medicare inpatient claims, we selected all hospitalizations that resulted in a NH admission to 1 of the 202 study facilities. Because 109 of the surveys were completed in May 2006 and 93 were completed in January 2007, we chose hospitalizations ending in the second or third quarters of 2006 for those surveys completed in May 2006, and hospitalizations ending in the fourth quarter of 2006 or the first quarter of 2007 for those surveys completed in January 2007. This resulted in 21,394 hospitalizations. Hospitalizations with no match to an MDS assessment within 30 days post hospitalization (or 60 days before hospitalization if no post-hospitalization MDS was available) were excluded from the analyses ($n = 890$). We also excluded hospitalizations that led to a community stay before the NH stay, and those that experienced a change in NH before a rehospitalization or the end of the 30-day follow-up period, whichever came first ($n = 1824$). This reduced the final analysis sample to 18,680 hospitalizations of 15,259 individuals.

Variables

We defined the study outcome using a 3-category variable: rehospitalized within 30 days of discharge from initial hospitalization, died within 30 days of discharge without having first been re-hospitalized, and survived with no rehospitalizations within 30 days of discharge of initial hospitalization. This third category served as the reference group in multinomial outcome analyses. Three categories were necessary to control for the competing risk of death.^{25–27} The rehospitalization did not necessarily have to be directly from the NH; however, the initial hospitalization did result in a NH stay in one of our study facilities.

The primary independent variables were a subset of the dimensions designed by Katz and colleagues²² as appropriate to test our hypotheses. The dimensions are reliable (Cronbach's alpha ranged from 0.81 to 0.65), and scale development and validation are reported elsewhere.²² For these analyses, we considered appointment process, physician supervision, interdisciplinary involvement, and interpersonal relationships (Table 1). *Appointment process* combined 3 items: whether the NH had written contracts with physicians, whether NHs hired physicians directly, and the detail of its bylaws. A fourth item (a formal process for granting attending privileges), which was originally part of the appointment process dimension, was not used, as it was available from only one wave of survey respondents. *Physician supervision* included the extent to which the medical director's leadership style involved checking up on the physicians, and the extent to which the physician's work was monitored closely. *Interdisciplinary involvement* measured the extent to which the physician was the primary representative of the NH for the families, the physician was expected to attend care plan meetings, and the physician was expected to assume the leadership role in team meetings. Finally, *interpersonal relationships* measured the quality of the relationship between the medical director and (1) the administrator and (2) the director of nursing, the quality of the relationship between the physicians and the licensed nurses, and the extent to which the medical staff was respected in the NH.

We also considered 2 single-item measures that were originally incorporated into a dimension labeled *staff composition* by Katz and colleagues.²² They were the proportion of residents cared for, on average, by a single attending physician, and an indicator that a facility had fewer than 10% of residents cared for by their own physician (ie, a community physician who is neither salaried by nor works for the NH). This latter measure represents the concept of a closed-staff model of care.

Detailed information about each measure is found in Table 1. For multi-item dimensions, items were standardized to a range of 0 to 1 and then averaged together to create the overall dimension. Standardization was done primarily for 2 reasons: (1) so that individual items within a scale were not given undue weight, and (2) to have dimensions whose effect sizes would be comparable in the multivariate analyses. Higher scores reflect higher levels of MSO. We grouped the proportion of residents seen on average by a single attending physician into 3 groups: fewer than 10%, 10% to less than 20%, and 20% or greater.

We also controlled for a number of resident and facility level covariates, many of which have been used in studies of NH hospitalizations.^{28,29} We included the demographic characteristics of age, race (black versus other), and gender. We included the following chronic medical conditions as reported on the MDS that might predispose residents to repeat hospitalizations: diabetes, chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), and cardiac dysrhythmias. We also controlled for other measures of morbidity and functioning, including a 28-item additive activities of daily living (ADL) scale, a cognitive performance score of 5 or 6 indicating severe cognitive impairment, and the annual facility average RUGs (resource utilization groups) casemix index for all residents in the NH (a per-person ratio of staff time needed to care for the casemix severity of the resident, which is above or below the national average). An indicator of taking more than 9 medications over the past week was also included as a measure of severity of condition. Finally, at the resident level, we included the presence of do not resuscitate (DNR) orders, and an indicator of whether the resident was in a NH for at least 90 days before the initial hospitalization, indicating that the NH stay was likely long term and not postacute.

Because MSO is likely related to several other facility characteristics that have also been shown to be related to hospitalizations, we controlled for confounding at the NH level. We included indicators of profit ownership, chain affiliation, and the presence of a special care unit. Total number of beds controlled for NH size, the churn rate (ie, the ratio of the number of admissions to total beds in 2006), and the proportions of residents paid for by Medicare or Medicaid to control for the NH's aptitude to provide postacute care and staffing measures, including the proportion of nursing staff (registered nurses [RNs] and licensed practical nurses [LPNs]) who are RNs; total direct care by RNS, LPNs, or certified nursing assistants [CNAs] (hours per day per resident); and the presence of any nurse practitioners or physician assistants.

Finally, we controlled for the length (in days) of the index hospitalization as a measure of severity of the recent hospitalization. We included a dummy variable to indicate missing DNR orders owing to the relatively high proportion of observations missing this indicator (4.0%). Other variables had missing values among 0% to 1.3% of the study observations, which together resulted in a loss of 505 residents, for a final sample of 18,175 observations in the multivariate analyses.

Statistical Analysis

The 3-category outcome was modeled using multinomial multivariate logistic regression. The model was fit using a population-averaged generalized estimating equation (GEE), allowing hospitalizations to be nested within NHs. Multilevel modeling postulates that decisions surrounding hospitalizations have similar experiences within facilities.

Because the GEE procedure used does not allow for a multinomial outcome, separate multilevel logistic regression models were estimated for any rehospitalization within 30 days of discharge from an index hospitalization versus survived 30 days post hospitalization with no rehospitalization, and died within 30 days of discharge without having been

rehospitalized versus survived 30 days post hospitalization with no rehospitalization. This method provides unbiased estimates with potentially inflated standard errors that converge to correct estimates with larger samples.³⁰ Because the sample was large, inflated standard errors were not a serious concern.

All analyses were conducted using Stata/SE 11.1 (College Station, TX) and reported with 2-tailed *P* values. For ease of interpretation of the effect of continuous covariates, multivariate results are presented as the coefficient and its standard error.

Results

Descriptive Statistics

Table 1 describes the MSO indicators and dimensions in the 202 freestanding NHs in our sample. Means and percentages for individual items are provided before standardization, whereas the dimension score itself is standardized to fall between 0 and 1. There is a relatively low level of a structured appointment process with only 14% of NHs having a written contract with physicians, 9% employing physicians directly, and a modest level of detail in the bylaws. The score for the overall dimension has a mean of only 0.21 (interquartile range 0.08 to 0.33). Physician interdisciplinary involvement also has a mean dimension score below 0.5, whereas physician supervision and interpersonal relationships score higher.

Table 2 describes the hospitalization and resident characteristics of the 18,680 sample hospitalizations, as well as additional characteristics of the 202 NHs. Of the 18,680 index hospitalizations, 20% had a rehospitalization within 30 days, and 5% died within 30 days without first having been rehospitalized. Among the 3788 re-hospitalizations, 631 (16.7%) were rehospitalized and subsequently died, both within the 30-day window (data not shown).

On average, hospitalizations occurred among individuals who were 79.6 years old. Among all hospitalizations, 34% were for men and 10% for blacks. Hospitalizations occurred among individuals with an average ADL severity score of 17.4, and 8% were severely cognitively impaired (cognitive performance scale [CPS] score 5 or 6). Thirty-four percent of hospitalizations were among those with diabetes, 26% with CHF, 22% with COPD, and 13% with cardiac dysrhythmias. Two-thirds of hospitalizations were among individuals who had taken more than 9 medications in the previous 7 days, and 32% of index hospitalizations lasted longer than 1 week, whereas only 8% lasted 2 or fewer days. The average NH casemix index (RUGs) was 1.2. Finally, only 14% of index hospitalizations occurred among long-stay NH residents.

Of the 202 freestanding NH facilities, two-thirds were for profit, and 60% were part of a chain. More than one-third (36.1%) had a special care unit, and the average facility had 144 beds. On average, there were 1.8 admissions per NH bed during 2006. The RN-to-total nursing staff ratio was 0.3, and, on average, NHs provided 3.6 total direct care hours by RNs, LPNs, or CNAs per resident day. Nearly 70% of facilities (68.8%) had at least 1 nurse practitioner or physician assistant. The average proportion of residents paid for by Medicare across facilities was 15%, and it was 60% for Medicaid.

Multilevel Model Results

Table 3 presents the multivariate results. Appointment process was the only dimension that was significant, at a .05 level. The single item "proportion of residents cared for on average by a single attending" also showed significance. All other MSO variables did not attain statistical significance and had a small effect size. Specifically, controlling for resident,

hospitalization, and NH characteristics, a more formal and structured appointment process was associated with fewer rehospitalizations compared with survival of 30 days without a rehospitalization (beta = -0.43, $P = .010$). Contrary to our expectation, a higher proportion of residents seen by a single attending physician was associated with more (not less) rehospitalization compared with the reference (beta = 0.18, $P = .025$).

Discussion

To our knowledge, this is the first study to show a direct relationship between NH MSO features and resident outcomes. Although not as robust as we expected, our hypotheses were partially supported. Following the hypotheses borne of the Roemer and Friedman¹⁸ article and subsequent articles regarding the association of MSO in hospitals and inpatient quality of care, our results do suggest that a more formal appointment process that links physicians to NHs through contracts and direct hire and has detailed bylaws results in fewer rehospitalizations. One standard deviation greater formal appointment was associated with 16% lower odds of rehospitalization. This is one of the larger effect estimates in the model. A formal appointment process speaks to the credibility and value of the physician within the NH. In this context, physicians would be expected to be more fully integrated into the “NH culture,” which potentially affects communication processes and level of risk taking.

Our finding that having a larger proportion of residents cared for by a single attending physician is related to more rehospitalization appears, on the one hand, to be contrary to our original hypothesis. However, even though we control for the number of beds, it may be that the relationship differs within large and small facilities. We tested an interaction between the proportion of residents cared for by a single provider and facility sizes of no more than 50, 51 to 200, and more than 200 beds and found that although the interaction did not meet statistical significance (likely owing to a lack of power resulting from only 202 study facilities), the results suggest that the original finding was related to large facilities only. By contrast, a larger proportion of residents cared for by a single provider appears to be related to fewer rehospitalizations in small facilities compared with larger ones (results not shown). This finding will require further validation using a more robust sample. Additional variables that might conceivably affect hospitalization rates but were not part of this analysis include physician and nursing competency, hospital bed availability, penetration of managed care, physician availability, and regional practice variations. These factors may explain, in part, why other hypothesized relationships did not appear to be related to rehospitalizations (closed-staff model, greater physician supervision, or better relationships among the leadership).

Although 30-day rehospitalization is a good target, in so far as it is clearly an event that is important to contain, other hospitalization measures, such as potentially avoidable or preventable ones, are worth examination, as they might relate more particularly to the knowledge and skill that medical staff can afford in facilities where their practice is well organized.

A major concern is that there are simply not enough medical staff who care for NH residents, as incentives to provide care in NHs are misaligned, especially with regard to hospitalization where payment to medical staff is better. Thus, the meaning of MSO is mixed, as it applies differently in facilities that are able to attract medical staff and in facilities that scramble for medical care.

Limitations of this study are its small sample size; with 202 facilities and 1 survey response it is hard to make conclusive statements. Although the 202 facilities appear to resemble the free-standing facilities nationwide, the sample is still nonrandom. More years of longitudinal

observation of MSO would allow for testing the causal effect of MSO on rehospitalization, which is not possible with a cross-sectional study. Finally, a closer examination of the measures of those MSO concepts, as presented by Roemer and Friedman,¹⁸ is warranted. Future studies should address these limitations, while also examining other resident outcomes and processes of NH care.

Conclusion

Although this study's results are only suggestive, it carries a potential for implications for policy and planning. Clearly, in the new era of accountable care organizations and bundled payment, it would be important to provide better care that is well coordinated in less expensive facilities. Thus, this study is important, as it provides the first evidence of the potential for policy and planning intervention that could be targeted to developing more stringent appointment processes, and consideration of appropriate volume of care per medical provider.

Acknowledgments

This study was funded by National Institute on Aging (NIA) R21 AG030191-01 (PI Orna Intrator); NIA P01AG027296-01A1 (PI Vincent Mor); NIA R21 AGO25246 (PI Paul Katz); and Health Resources and Services Administration 5D31HP70118-05 (PI Paul Katz). The research protocol was approved by the relevant institutional review boards and was granted a Waiver of Authorization for individual consent. The use of Centers for Medicare and Medicaid Services (CMS) data was approved by a CMS Data Use Agreement. Earlier versions of this article were presented at 2011 Academy Health Research Meeting and 2011 Gerontological Society of America Research Meeting.

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Table 1

Description of MSO Indicators/Dimensions in 202 Freestanding Nursing Homes

Indicator/Dimension	Dimension Components	Individual Item Scoring	% or Mean (SD)*
Residents cared for on average by a single attending	Not applicable, single-item indicator	Proportion	0.20 (0.17)
Closed Staff Model	Not applicable, single-item indicator	Facility has fewer than 10% of residents cared for by their own physician (ie, a community physician who is neither salaried by nor works for the nursing home)	39.0%
Appointment Process			0.21 (0.20)
	Does nursing home have a written contract with physicians	1=yes, 0=no	14.0%
	Does the nursing home employ physicians directly	1=yes, 0=no	9.0%
	Detail of bylaws	1=not at all, 5=very	2.53 (1.17)
Physician Supervision			0.54 (0.23)
	Leadership style as involves checking up on physician	1=strongly disagree, 5=strongly agree	3.15 (1.10)
	Quality of each physician's work is monitored closely	1=strongly disagree, 5=strongly agree	3.15 (0.95)
Physician Interdisciplinary Involvement			0.42 (0.22)
	Physician is primary nursing home representative for families	1=strongly disagree, 5=strongly agree	2.82 (1.00)
	Physicians are expected to attend care plan meetings	1=strongly disagree, 5=strongly agree	2.55 (1.15)
	Physicians are expected to assume the leadership role in team meetings	1=strongly disagree, 5=strongly agree	2.63 (1.11)
Informal Dynamics (Interpersonal Relationships)			0.77 (0.16)
	Quality of your relationship between medical director and administrator	1=poor, 5=excellent	4.05 (0.90)
	Quality of your relationship between medical director and the director of nursing	1=poor, 5=excellent	4.14 (0.85)
	Relationship between physicians and licensed nurses	1=poor, 5=excellent	3.83 (0.77)
	Medical staff gets no respect in the nursing facility	1=strongly agree, 5=strongly disagree (reversed for the dimension)	4.22 (0.93)

MSO, medical staff organization.

* For ease of interpretation, dimension scores are presented standardized, individual items are not.

Table 2**Hospitalization, Resident, and Facility Characteristics of the Study Sample and Facilities**

	n (%)
<i>Outcome</i>	(n = 18,680)
Survived, no rehospitalization after 30 days	14,008 (75.0)
Rehospitalized	3788 (20.3)
Died within 30 days before any rehospitalization	884 (4.7)
<i>Hospitalization/Resident Characteristics</i>	
Age, mean (SD)	79.6 (10.7)
Male	6386 (34.2)
Black	1803 (9.8)
ADL severity (0 to 28; mean [SD])	17.4 (6.4)
CPS score of 5 to 6	1437 (7.7)
Diabetes	6266 (34)
Cancer	1190 (6.5)
CHF	4840 (26.2)
COPD	4008 (21.7)
Cardiac dysrhythmias	2360 (12.8)
Took more than 9 medications in past 7 days	12,511 (67.0)
NH Casemix Index (RUGs; mean [SD])	1.2 (0.3)
Do Not Resuscitate Order	
No	11,682 (62.5)
Yes	6246 (33.4)
Unknown	752 (4.0)
NH stay within 90 days prior to hospital admission	2553 (13.7)
Index hospitalization length of stay	
0–2 days	1440 (7.7)
3–7 days	11,138 (59.6)
8–14 days	4262 (22.8)
>14 days	1840 (9.9)
<i>Facility Characteristics</i>	(n = 202)
For profit	139 (68.8)
Part of chain	120 (59.4)
Any special care units	73 (36.1)
Total no. beds, mean (SD)	143.9 (91.4)
Churn rate, annual admissions per bed; mean (SD)	1.8 (1.2)
RN to total nursing staff ratio, mean (SD)	0.3 (0.2)
Total direct care by RNS, LPNs, or CNAs, hours per day per resident; mean (SD)	3.6 (3.9)
Any NPs/PAs	139 (68.8)
Proportion Medicare, mean (SD)	0.2 (0.1)
Proportion Medicaid, mean (SD)	0.6 (0.2)

ADL, activities of daily living; CHF, congestive heart failure; CNA, certified nursing assistant; COPD, chronic obstructive pulmonary disease; CPS, cognitive performance scale; LPN, licensed practical nurse; NH, nursing home; NP, nurse practitioner; PA, physician assistant; RN, registered nurse; RUG, resource utilization group.

Table 3
Multinomial Logistic Regression Analysis of the Association Between NH MSO and 30-Day Rehospitalizations

	<u>Rehospitalization vs. No Rehospitalization</u>			<u>Died & Not Rehospitalized vs. No Rehospitalization</u>		
	Coefficient	SE	P Value	Coefficient	SE	P Value
<i>MSO Indicators</i>						
Proportion of residents cared for per attending (ref: 10%)						
10% to 20%	0.07	0.08	.388	-0.26	0.13	.048
More than 20%	0.18	0.08	.025	0.06	0.13	.653
Facility has fewer than 10% of residents cared for by their own physician	0.04	0.09	.665	0.13	0.14	.372
Appointment process	-0.43	0.17	.010	0.37	0.26	.152
Physician supervision	0.07	0.15	.639	-0.83	0.25	.001
Physician interdisciplinary involvement	0.02	0.15	.896	-0.30	0.25	.230
Interpersonal relationships	-0.33	0.20	.093	-0.58	0.33	.078
<i>Resident Characteristics</i>						
Age	-0.01	0.00	<.001	0.02	0.00	<.001
Male	0.15	0.04	<.001	0.45	0.08	<.001
Black	0.05	0.07	.507	-0.29	0.15	.054
ADL severity (0 to 28)	0.03	0.00	<.001	0.15	0.01	<.001
CPS scale of 5 or 6	0.07	0.08	.343	0.47	0.11	<.001
Diabetes	0.13	0.04	.002	-0.03	0.09	.716
CHF	0.42	0.04	<.001	0.29	0.09	.001
COPD	0.26	0.05	<.001	0.36	0.09	<.001
Cardiac dysrhythmias	-0.25	0.06	<.001	-0.33	0.12	.005
Took more than 9 medications in past 7 days	0.14	0.04	.001	-0.22	0.08	.008
NH Casemix Index (RUGS)	0.69	0.10	<.001	1.18	0.18	<.001
Do Not Resuscitate Order (ref: no)						
Yes	-0.11	0.05	.018	0.93	0.09	<.001
Unknown	-0.14	0.14	.317	0.17	0.28	.535
NH stay within 90 days before hospital admission	-0.46	0.07	<.001	-0.62	0.12	<.001
Index hospitalization length of stay (ref: 0–2 days)						
3–7 days	-0.13	0.08	.095	-0.30	0.15	.047
8–14 days	0.21	0.08	.012	0.09	0.16	.559

	Rehospitalization vs. No Rehospitalization			Died & Not Rehospitalized vs. No Rehospitalization		
	Coefficient	SE	P Value	Coefficient	SE	P Value
More than 14 days	0.41	0.09	<.001	0.46	0.18	.009
<i>NH Characteristics</i>						
For profit	-0.10	0.07	.178	-0.07	0.12	.543
Part of chain	0.06	0.07	.354	0.10	0.12	.365
Any special care units	0.04	0.06	.543	0.19	0.11	.076
Total number of beds	0.00	0.00	.367	0.00	0.00	.327
Churn rate (annual admissions per bed)	0.06	0.04	.091	0.16	0.06	.005
RN to total nursing staff ratio	0.11	0.18	.552	0.37	0.29	.205
Total direct care by RNs, LPNs, or CNAs (hours per day per resident)	0.00	0.02	.988	0.02	0.02	.515
Any NPs/PAs	-0.03	0.07	.646	-0.13	0.10	.203
Proportion Medicare	0.00	0.00	.912	0.00	0.01	.416
Proportion Medicaid	0.00	0.00	.101	0.00	0.00	.392
Constant	-2.55	0.34	<.001	-8.87	0.64	<.001

ADL, activities of daily living; CHF, congestive heart failure; CNA, certified nursing assistant; COPD, chronic obstructive pulmonary disease; CPS, cognitive performance scale; LPN, licensed practical nurse; NH, nursing home; NP, nurse practitioner; PA, physician assistant; RN, registered nurse; RUG, resource utilization group.