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**MULTIPLE HOSPITALIZATIONS AMONG
ELDERLY NURSING FACILITY RESIDENTS:
IS RURAL RESIDENCE A RISK FACTOR?**

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EXECUTIVE SUMMARY

Multiple Hospitalizations of Nursing Home Residents: The Problem

The problem of hospitalizations of nursing facility (NF) residents has important implications for both the cost and quality of care. Hospitalizations of NF residents pose serious health risks for residents, often placing them at greater risk of "cascading dependency". Although we know that over one quarter of all NF residents are hospitalized annually, geographic variations in hospitalization rates have not been reported in the literature. This problem may be more prevalent among rural NF residents due to the higher rates of nursing home use, greater supplies of hospital beds, and lower physician supplies in rural areas.

Recent Medicare payment policy changes may have important effects on the problem of multiple hospitalizations of nursing home residents. In 1997 the Balanced Budget Act required the implementation of a Medicare Skilled Nursing Facility (SNF) prospective payment system (PPS) beginning in 1998. Under this system, SNFs have been paid a case mix adjusted per diem rate which, with lower annual adjustments than had been experienced under prior payment rules, has resulted in significant reductions in the growth of payments to SNFs. In response to concerns about access to SNF services for high acuity patients, Congress modified some of the BBA changes in SNF payment policy in the Balanced Budget Refinement Act of 1999 (BBRA). Specifically, per diem payment rates for selected high acuity case mix categories were increased by 20% and the annual increases in per diem rates for fiscal years 2001 and 2002 were set at 4%.

Notwithstanding the changes in the SNF payment rates made in the BBRA, there continue to be serious concerns about the ability of many skilled facilities to achieve the significant cost reductions required under the BBA and the impact that these reductions may have on SNF access and quality for Medicare beneficiaries. Smaller, rural SNFs may have a more limited ability to absorb cuts in SNF payment without significant reductions in staff or other services critical to the quality of care.

This Study

This study addresses two main questions: (1) Do rural NF residents experience higher rates of NF re-admission from a hospital than urban residents? and (2) If they do, to what extent do resident, facility and market/area characteristics contribute to NF re-admission rates from hospitalizations among rural and urban residents? Differences in rates of NF re-admissions

from a hospital have important potential implications for the quality and outcomes of care for older rural residents. Understanding whether and why these rates differ is also important for gauging the potential impact of payment and other policy changes on the quality of care in rural NFs.

Study Methods

This study uses resident assessment data from the Minimum Data Set (MDS+) collected by states participating in the Health Care Financing Administration's, Multi-state Case Mix Demonstration. MDS+ information includes: admission and discharge data, demographic characteristics, prior living arrangements and residential history, functional and cognitive status, vision, hearing, and communication patterns, mood and behavior, psychosocial well being, health status, oral and dental status, medications, and treatments. We used resident assessment data from calendar years 1994 and 1995 covering all residents and nursing facilities in Maine, Mississippi, and South Dakota and all skilled nursing facilities (SNFs) in New York. These data are linked with the Area Resource File and facility information from the states to obtain information on facility and area characteristics.

Summary of Results

Study results indicate that rural NF residents are more likely to have multiple re-admissions from a hospital. This association is evident in all four states and persists even after controlling for other factors, including state of residence and resident, facility and market-level characteristics. Further analysis indicates that the effect of rural residence on the probability of multiple NF re-admissions is greater among newly admitted rural residents than among rural residents not classified as new admissions. In addition to rural residence, other factors associated with an increased likelihood of multiple NF re-admissions from a hospital include: state of residence, diagnosis of congestive heart failure, and no discharge planned at the time of admission. Residents classified in the "Rehab", "Special Care", and "Clinically Complex" case mix groups all had a significantly greater likelihood of multiple NF re-admissions from a hospital. Older age (80+) and being in the "Cognitive" case mix group are associated with a lower likelihood of multiple hospitalization.

Conclusions and Policy Implications

The literature leaves little doubt that multiple hospitalization of nursing home residents poses a significant health risk for residents (Castle and Mor 1996). The findings of this study, therefore, raise important quality of care concerns. Addressing this problem is complicated by

several factors. Disentangling the many factors that contribute to this problem is difficult. In addition, implementation of facility-level or policy remedies may be compromised by staffing shortages, the need for staff education and training, and/or the need for greater physician involvement and support for medically complex NF residents. Changing and sometimes conflicting Medicare and Medicaid payment and regulatory policies and incentives may also make solving this problem more difficult.

The patterns of findings from this and other research suggest that there are a number of key factors influencing the decision to hospitalize a nursing home resident, including the clinical capacity of the facility, the overall acuity of the facility's residents, and the individual characteristics of residents. Other studies (Intrator et al. 1999) indicate that the presence of additional medical resources, either physicians or physician extenders, significantly reduces the risk of hospitalizations. This finding suggests a strategy of enhancing the availability and use of physician and other medical services to reduce hospitalizations (Garrard et al. 1990). Implementing such an approach in rural nursing homes may be difficult, however. The availability of qualified health personnel (e.g. geriatric nurse practitioners, RNs) has typically been a problem in many rural areas. Likewise, the limited availability of physicians in rural areas, their heavier workloads, and the limited reimbursement for care provided in nursing facilities will make it more difficult in rural areas to obtain greater physician attention to NF residents.

Expanded availability and use of video and computer-based technologies such as telehealth may be useful in overcoming these limitations. Telehealth technologies can and are being used for home care and other applications that have the potential for enabling offsite diagnosis of medical and other problems, thereby reducing unnecessary emergency room use or hospitalization of LTC consumers (Cluff 1996). These technologies may have potentially useful applications in rural nursing homes (and other residential care settings) where access to specialty services is a known problem and likely contributor to the problem of hospitalizations.

The clinical and other characteristics of nursing facility residents are likely to continue to change as Medicare and state Medicaid programs move toward case mix-based payment systems for nursing facility care which encourage facilities to admit patients with heavier care needs. State efforts to restrict eligibility for nursing home care to those with the greatest medical need, to create new residential care alternatives, such as assisted living, and to expand home and community-based service options for patients who might otherwise have been admitted to a

nursing facility, will further contribute to these trends. For all of these reasons, it is critical that we understand better the challenges of, and potential strategies for, caring for medically complex residents in rural NFs and to identify potential strategies for doing so more effectively. Such strategies might include greater use of geriatric nurse practitioners and other physician extenders, and increasing payments to physicians providing services in nursing homes (Freiman and Murtaugh 1995).

The feasibility and effectiveness of these strategies for addressing the problem of multiple hospitalization of NF residents will be significantly affected by the response of rural NFs to the SNF payment policy provisions of the BBA and the BBRA. There are serious concerns about the ability of many skilled facilities, including those in rural areas, to achieve the significant cost reductions required without reducing beneficiary access and/or the quality of care. Smaller, rural SNFs may be less able to absorb cuts in SNF payment without significant reductions in staff. Any staffing reductions would, of course, run counter to the need suggested by this and other studies for increasing clinical resources. Similarly, for some financially vulnerable rural hospitals which have diversified into SNF level care, cuts in SNF payments will be difficult to absorb and may result in reductions in staffing or other behavioral responses that could jeopardize the quality of care.

INTRODUCTION

Multiple transfers of nursing facility residents between nursing facilities (NFs) and hospitals is a significant problem because of the high cost of hospitalization and concern about the quality of care. Labeled a "ping-pong" effect (Lewis, Cretin and Kane, 1985), multiple hospitalizations of NF residents pose particularly negative health risks for residents (Tresch, Simpson, and Burton 1985; Brandeis et al. 1994, Allman et al. 1994), often placing an older person at greater risk of "cascading dependency" (Creditor 1993).

The magnitude of this problem is significant. Based on the most recently available national data (1987), 17% of all hospital stays and 25% of annual hospital days used by persons aged 65 and older were consumed by persons who were NF residents at some time during the year (Freiman and Murtaugh 1995). From data on NF residents, we also know that 28.4% of all NF residents are hospitalized annually (Murtaugh and Freiman 1995).

Although geographic differences in the hospitalization rates of NF residents have not been reported in the literature, there is reason to believe that this problem may be more prevalent among rural NF residents because of the higher rates of nursing home use, barriers to the provision of certain types of medical and nursing care in rural NFs, greater supplies of hospital beds, and lower physician supplies in rural areas. In a prior study of nursing facility discharge rates for rural and urban residents hospitalized with a hip fracture in Maine, we found that rural residents experiencing an initial NF admission following hip surgery had higher rates of re-hospitalization followed by NF re-admission than urban NF residents (Coburn et al. 1997).

A variety of factors may be related to NF to hospital transfers (Castle and Mor 1996), including specific health problems of residents (Murtaugh and Freiman 1995), the capacity of nursing facilities to care for seriously ill residents during acute episodes (Stearns et al. 1996), and policy and financial incentives for nursing facilities to shift the costs of caring for seriously ill residents to hospitals (Stearns et al. 1996; Rubenstein, Ouslander and Wieland 1988). With regard to the latter, the NF-to-hospital transfer problem may be symptomatic of fragmented or mis-aligned incentives in state nursing home and federal hospital reimbursement policies (Freiman and Murtaugh 1995; Stearns et al. 1996), particularly as they pertain to persons who are dually-eligible for Medicare and Medicaid (Smits 1995). Evidence of such policy conflict is suggested by previous findings that the rate of NF to hospital to NF transfers may be sensitive to both nursing home reimbursement rates and hospital bed supply (Stearns et al. 1996).

Barker et al. (1994) have recommended policy and other strategies to reduce unnecessary hospitalizations, including modifying NF staffing, expanding the use of geriatric nurse practitioners, and increasing payments to physicians providing services in NF (Freiman and Murtaugh 1995). The feasibility and implications of such interventions, and the effects of reducing hospital use in rural areas, however, have not been addressed. In rural communities, where the supply of physicians and specialty health care providers is lower, efforts to increase NF capacity will be more difficult to achieve. Moreover, the financial implications of shifting care from hospital to nursing facilities in rural areas, with a potentially significant negative effect on rural hospital revenues, are not well understood.

The purposes of this study were to examine the geographic variations in hospitalizations and NF re-admissions from the hospital among rural and urban NF residents and to evaluate the contribution of resident, facility and market/area characteristics to NF re-admission rates.

METHODS

Data Sources

This study uses resident assessment data from the Minimum Data Set (MDS+) collected by states participating in the Health Care Financing Administration's, Multistate Case Mix Demonstration. We used resident assessment data from calendar years 1994 and 1995 covering all residents and nursing facilities in Maine, Mississippi, and South Dakota and all skilled nursing facilities (SNFs) in New York.

MDS+ resident assessments are completed on all residents of nursing facilities by staff at each facility (Morris et al. 1990). In our four states, they are required at admission, then on a quarterly basis or whenever there is a significant change in status except in New York, where the subsequent assessments are only required annually. MDS+ information includes: admission and discharge data, demographic characteristics, prior living arrangements and residential history, functional and cognitive status, vision, hearing, and communication patterns, mood and behavior, psychosocial well being, health status, oral and dental status, medications, and treatments (Morris, Fries, Mehr et al, 1994).

Admission data include the date of admission, where the resident was admitted from (home, another nursing home, an acute care hospital, or other), and the resident's previous living arrangement (i.e. alone, with others, or in a facility). These data are collected whenever a person is newly admitted or readmitted to a nursing facility.

Facility data were obtained directly from the states and linked to the assessment data using the state facility identifier. County-level data for demographic and supply variables were obtained from the Bureau of Health Professions' Area Resource File (ARF) for 1996 and were linked to the facility file for each state using county codes.

Study Sample and File Construction

The 1994-1995 multi-state MDS data contain assessments on a total of 195,425 nursing home residents: 30,714 from Mississippi, 13,977 from South Dakota, 21,781 from Maine, and 128,953 from New York. Because New York is much larger and more urban than the other three states, we limited the New York sample to the 43,107 residents of facilities outside New York City. Even with this exclusion, New York had only 13% of its residents in rural (non-metropolitan) facilities compared with more than 50% in each of the other states.

The sample for this study represents an "admissions" cohort from each of the four states. The sample includes all residents with either an initial or second admission to a nursing facility during 1994. We chose to limit the sample to an "admission cohort" largely because of data limitations. In particular, we lacked confidence in older (pre-1993) admission information. The final sample for the study includes a total of 35,535 residents: 11,892 in Mississippi, 4,942 in South Dakota, 7,155 in Maine, and 11,546 in New York.

Separate resident-level analytic files were constructed for each of the four states containing information on nursing home admissions and discharges as well as baseline data from the first 1994 assessment on resident, facility, and county characteristics. Analyses were conducted using both the individual state files and a file that pools the data from the four states.

Study Variables

Dependent Variables: Re-admission to a nursing facility from a hospital is the outcome of interest in this study. The use of re-admission from a hospital as our measure of hospitalization was due partly to the lack of NF discharge data from New York. In addition, information on where residents came from was considered more reliable than information on where they went upon discharge from the NF. We also felt that re-admission from a hospital was a more appropriate measure in this study, since we are not simply concerned with how often nursing homes send their patients to a hospital, but how often patients with multiple nursing home stays are hospitalized between these stays.

In order to define these variables, a resident-level file of nursing home stays was constructed for each state. For each separate stay, this file contained the admission date, the

type of care setting the resident was admitted from, and the discharge date and type of discharge. Any admission to a nursing facility after the first one in the file was considered as a re-admission. For those residents in a nursing home at the beginning of the year, the first admission in the file was before the beginning of 1994, but all subsequent admissions in the file had to be in 1994 or 1995. After duplicate and overlapping stays were eliminated, the number of nursing home stays and number of re-admissions from a hospital were calculated for each resident.

NF re-admissions are measured in several ways. As indicated in Figure 1, we used a dichotomous resident-level measure to indicate whether the resident had any nursing home re-admission from a hospital. Our multivariate analyses rely upon a resident-level, dichotomous variable measuring whether a resident had 2 or more NF re-admissions from a hospital.

Independent Variables: Independent variables include geographic (urban-rural) indicators, a wide range of individual resident characteristics, and a more limited number of facility and county characteristics (Figure 1). The geographic indicators were defined at the county level to ensure comparability across states and make it possible to use the Area Resource File (ARF) data. For each resident, the primary geographic variable indicates whether or not their county of residence was within a metropolitan county as defined by the U.S. Office of Management and Budget. We also used the Beale urban-rural continuum codes (Butler & Beale 1994) to divide these counties into four narrower categories: large MSAs, medium/small MSAs, non-metropolitan counties adjacent to an MSA, and non-metropolitan counties not adjacent to an MSA. Although we performed a variety of analyses using the urban-rural continuum codes, our final multivariate models rely on the dichotomous metropolitan-non-metropolitan comparisons, since the results using the additional geographic detail added little new information or insight. Other independent variables used in the analysis are described in Figure 1.

Data Analysis

The individual NF resident is the unit of analysis in all of our analyses. Analyses were conducted using both the individual state files and the 4-state pooled data set. Overall means and frequencies for rural and urban residents were calculated for each state. T-tests and chi-square test statistics were used to analyze differences in the characteristics of rural and urban nursing home residents in the separate states and in the pooled data set. Multivariate logistic regression models were estimated using the 4-state pooled data to evaluate rural-urban

differences in the probability of having multiple re-admissions from a hospital, controlling for the effects of state of residence, and resident, facility, and county characteristics. All of our multivariate analyses were conducted using SUDAAN to accommodate the potential for the clustering of residents by facility.

FIGURE 1 VARIABLE DEFINITIONS, MEASUREMENT AND SOURCES OF DATA

DEPENDENT VARIABLES	Definition	Source of Data
NF re-admission	NF re-admission from a hospital (yes=1/no), number of re-admissions, and % of facility residents with any re-admission from a hospital	MDS+
Multiple re-admissions	Multiple (2+) NF re-admissions from a hospital (yes=1/no) and % of facility residents with multiple re-admissions from a hospital	MDS+
INDEPENDENT VARIABLES		
General Resident Characteristics:		
Rural residence	Metropolitan and non-metropolitan county of residence; Beale Urban-Rural Continuum Codes	<i>Area Resource File</i>
Gender	Female (=1) vs. male	MDS+
Marital status	Currently married (=1) vs. not married	MDS+
Race	White, non-hispanic (=1) vs. all others	MDS+
Capacity for Improvement	The resident's judgement of whether their ability to perform activities of daily living (ADLs) was likely to improve (=1)	MDS+
Expected Discharge	Assessor's expectation of whether the resident was likely to be discharged within 90 days (=1)	MDS+
Case Mix Index	Weight assigned by HCFA to the resident's case mix (RUGIII) group - a measure of expected resource utilization (Range = 0-6)	MDS+
Number of Diagnoses	Total number of specific diagnoses or health conditions (total of 31) checked on the assessment form (Range = 0-24)	MDS+
RESIDENT'S HEALTH OR FUNCTIONAL STATUS:		

CHF(Congestive Heart Failure)	Resident had a diagnosis of congestive heart failure checked on assessment form (=1)	MDS+
Hip Fracture	Resident had a hip fracture within the past 180 days (=1)	MDS+
Pressure Ulcers	Resident had 1 or more pressure ulcers at any stage (=1)	MDS+
ADL Count	Count of the number of five specified activities of basic living (bed mobility, transfer, locomotion, eating, and toileting) the resident was unable to perform without physical assistance (Range = 0-7)	MDS+
CPS Score	Resident's score on the Cognitive Performance Scale (CPS), a measure of cognitive status [Morris, Fries, Mehr et al., 1994] which has values ranging from 0 (least impaired) to 6	MDS+
Verbalized Distress	Resident had verbally expressed feelings of distress, hopelessness, or anxiety during the last 30 days (=1)	MDS+
Avoidance of Social Interaction	Resident avoided interaction with other people (=1)	MDS+
FACILITY AND COUNTY CHARACTERISTICS:		
NF Beds	Number of beds in the nursing facility	State Facility Files
Facility ownership Type	Proprietary (=1) vs. not-for-profit or publicly owned	State Facility Files
County race	Percent of county population that was white, non-hispanic	Area Resource File
Poverty level	Percent of county population in poverty	Area Resource File
Hospital Bed Supply	Ratio of hospital beds to population 65 or over within county	Area Resource File
Nursing Home Bed Supply	Ratio of nursing home beds to population 65 or over within county	Area Resource File
Physician Supply	Ratio of physicians (allopathic and osteopathic) to population 65 or over within county	Area Resource File

RESULTS

Urban-Rural Differences in Resident Characteristics

Analyses of resident characteristics from the 4-state pooled data (Table 1) indicate significant differences between rural and urban NF residents in this sample. On average, the case mix index for rural residents is significantly lower than for urban residents. This difference appears to be largely accounted for by the significantly lower percentage of rural compared with urban NF residents in the “Rehabilitation” case mix group (13.8% versus 33.2%). The percentage of rural residents is also significantly lower in the “Not Assigned” case mix category. In contrast, a significantly higher percentage of rural than urban NF residents are classified in the “Extensive Care”, “Special Care”, “Clinically Complex”, “Cognitive”, and “Physical” case mix groups.

There are additional urban-rural differences in the characteristics of NF residents worth noting. As indicated in Table 1, a lower percentage of rural NF residents in this sample are newly admitted to the NF. A smaller proportion of rural residents in the sample have been judged by NF staff as “expected to be discharged”. Similarly, a smaller percentage of rural NF residents consider themselves as having the capacity for improvement. Compared with their urban counterparts in this sample, rural residents have a slightly lower mean number of diagnoses and have higher cognitive performance scores. Significantly higher percentages of rural than urban NF residents have a diagnosis of Congestive Heart Failure and have fractured their hip within the last 180 days.

Although cross-state comparisons are not the primary focus of this study, the data in Appendix Table 1 clearly reveal significant variations across the states in the characteristics of their nursing facility populations and in the percentage of residents with multiple nursing facility re-admissions following a hospitalization. These inter-state differences make statistical controls in our multivariate models especially important in evaluating the effects of rural residence on rates of NF readmission from a hospital.

Hospitalization Rates

Bivariate results indicate that rural residents in this sample are more likely to experience multiple NF re-admissions from a hospital than are urban residents (Table 2). This result holds in all four states where residents in rural facilities were more likely than urban residents to have multiple nursing facility stays, to have at least one re-admission from a hospital, and to have

multiple re-admissions from a hospital. Rural residents in all four states have higher mean numbers of NF stays.

TABLE 1 CHARACTERISTICS OF NURSING FACILITY RESIDENTS, POOLED DATA

	Total	Rural	Urban
All residents [N]	35,535	18,472	17,063
Mean casemix index (resident)	1.13	1.09 ^a	1.18
Mean case mix index (facility)	1.13	1.08 ^a	1.17
Case Mix Groups (%) :			
Rehab	23.10	13.8 ^a	33.2
Extensive care	1.81	2.1 ^a	1.5
Special Care	10.27	12.0 ^a	8.4
Clinically Complex	31.77	34.1 ^a	29.2
Cognitive	9.93	11.2 ^a	8.5
Behavior	0.53	0.58	0.46
Physical	21.29	24.95 ^a	17.33
Not Assigned	1.07	0.81 ^a	1.35
New admission	76.8	70.5 ^a	83.6
% Discharge planned 3 months	19.6	16.8 ^a	23.0
% Capacity for improvement-self	18.6	14.4 ^a	23.7
Mean age as of 1/1/94	80.1	80.4 ^a	79.7
% Female	68.2	67.8	68.7
% Married	22.4	23.0 ^b	21.9
% White	86.1	84.6 ^b	87.8
Mean number of diagnoses	3.70	3.7 ^b	3.7
Mean # ADLs requiring assistance	4.49	4.48	4.5
Mean CPS score	2.26	2.34 ^a	2.18
% CHF	22.9	25.7 ^a	19.9
% Hip fracture 180 days	6.92	5.5 ^a	8.6
% With pressure ulcers	17.08	15.3 ^a	19.0
% Impaired hearing	1.95	2.0	1.9
% Impaired vision	3.18	3.4 ^a	3.0
% Verbalized distress	15.87	16.1 ^a	15.6
% Avoiding interaction	2.47	2.6	2.3

^a < .01

^b < .05

Rural Residence and Multiple NF Re-admissions from a Hospital

We constructed multiple logistic regression models using the pooled state data to evaluate the relationship between rural residence and multiple NF re-admissions from a hospital. Table 3 presents the results of the final logistic regression model. These final models

do not include several variables, including the facility and county characteristics variables, which either added little to the analytic power of the model or were dropped to avoid problems with

TABLE 2 NURSING HOME STAYS AND NF RE-ADMISSIONS FROM A HOSPITAL, RURAL AND URBAN NF RESIDENTS, BY STATE

	Mississippi			South Dakota			Maine			New York ¹		
	Total	Non-metro	Metro	Total	Non-metro	Metro	Total	Non-metro	Metro	Total	Non-metro	Metro
All residents (N)	11,892	9,136	2,756	4,942	3,507	1,435	7,155	4,330	2,825	11,546	1,499	10,047
Multiple NF stays (%)	65.0	66.2 ^a	60.7	42.2	44.1 ^a	37.4	43.4	46.0 ^a	39.5	25.9	29.2 ^a	25.4
Number NF Stays (Mean)	2.25	2.28 ^a	2.13	1.70	1.75 ^a	1.59	1.62	1.66 ^a	1.55	1.33	1.39 ^a	1.32
Any re-admission from hospital (%)	58.8	60.1 ^a	54.5	31.5	33.2 ^a	27.2	36.4	38.4 ^a	33.2	19.6	21.2	19.4
Multiple re-admissions from hospital (%)	27.2	28.9 ^a	24.5	11.5	12.4 ^a	9.3	9.7	10.9 ^a	7.8	3.4	5.3 ^a	3.1

¹ Excluding NYC

^a p < .01

**TABLE 3 LOGISTIC REGRESSION MODEL:
MULTIPLE RE-ADMISSIONS FROM A HOSPITAL (POOLED ANALYSIS-SUDAAN)**

Variable	Odds Ratio	Confidence Interval
Intercept	0.11	0.08 – 0.15 ^a
Rural	1.17	1.00 – 1.37 ^b
Maine vs. NY	2.59	1.80 – 3.70 ^a
Mississippi vs. NY	6.92	4.78 – 10.02 ^a
South Dakota vs. NY	3.58	2.41 – 5.31 ^a
New Admission	0.19	0.18 – 0.21 ^a
Age 80+	0.91	0.84 – 0.98 ^a
Congestive Heart Failure	1.20	1.10 – 1.29 ^a
Discharge Planned	0.80	0.66 – 0.97 ^b
Rehab Group	1.20	1.02 – 1.41 ^b
Extensive Group	1.22	0.97 – 1.54
Special Care Group	1.34	1.19 – 1.52 ^a
Clinically Complex Group	1.16	1.06 – 1.28 ^a
Cognitive Group	0.87	0.76 – 0.99 ^b
Behavior Group	0.89	0.61 – 1.30
Not Classified Group	0.94	0.65 – 1.36

n=36,129

^a p ≤ .01

^b p ≤ .05

multicollinearity. These excluded variables included: the physician and hospital bed to population ratios and the county-level population variables, all of which were highly correlated with the rural-urban indicators; gender, which was highly correlated with marital status; the ADL measure, which was highly correlated with the case mix weight; and the count of medical diagnoses, which was highly correlated with congestive heart failure.

The results indicate that nursing home residents in rural counties have a higher risk of multiple NF re-admissions from a hospital, even after adjusting for the effects of other variables associated with such hospitalizations (OR 1.17; C.I.: 1.00-1.37; $p < .05$). This model was also run separately for each state (not shown). The results of these analyses indicate that the risk of multiple hospitalizations varies substantially across the four states, with the odds of hospitalization for non-metropolitan as compared to metropolitan residents being twice as high in New York (OR=2.08) and about 14% higher in Mississippi (OR=1.14) and Maine (OR=1.38). Only in South Dakota did the increased risk associated with rural residence seen in the bivariate analysis become statistically insignificant after adjusting for the effects of other variables in the model.

In order to understand better the relationship between rural residence and multiple hospitalizations, we tested for interactions with other variables in the model. In these analyses (not shown), we found a significant interaction ($p = .04$) between rural residence and new admission. Among new admissions, the odds ratio for having multiple re-admissions from a hospital for rural as opposed to urban residents is 1.29 (C.I. = 1.04-1.59), while it is 1.06 (C.I.= 0.94-1.23) among residents who were not new admissions. This indicates that among new admissions, rural NF residents were significantly more likely to have multiple hospitalizations. Among residents who had been in the nursing facility longer, there was no significant difference in rates of multiple hospitalization between rural and urban residents.

Other Predictors of Multiple Hospitalizations

State of residence is by far the single most important variable in our models in predicting multiple hospitalizations. In comparison with New York, Maine, Mississippi, and South Dakota each had significantly higher rates of multiple hospitalizations (Table 3). Even after adjusting for other key variables in our model, the odds ratios for multiple hospitalization in the separate states are highly variable, ranging from 6.92 in Mississippi to 2.59 in Maine. NF residents with congestive heart failure, and residents for whom discharge was not planned at the time of admission, had a significantly greater risk of multiple re-admissions from the hospital. Older age

(80+) is associated with a lower likelihood of multiple hospitalization. With the exception of residents classified in the “Extensive,” “Behavior,” and “Not Classified” groups, there was a significant association between a resident’s case mix classification and the probability of multiple hospitalization. Specifically, residents classified in the “Rehab”, Special Care”, and “Clinically Complex” case mix groups all had a significantly higher likelihood of multiple hospitalizations, while residents in the “Cognitive” group had a significantly lower likelihood of such hospitalizations.

Limitations of this Study

This study involves only four states, and we must therefore be cautious in generalizing these findings to the entire population of nursing facility residents in the United States. Although the findings appear to be quite robust, the significant variations across the states that are evident in this study also give reason for pause in attempting to generalize to all states. This variation is not unexpected given the known differences in the characteristics of the states, their Medicaid and long-term care eligibility and payment policies, and in the nursing home markets across the states. We would expect patterns of care, including the risk of hospitalization of NF residents, to be affected by variations in state NF eligibility policies, in the supply of NF and home care services, and other market characteristics.

SUMMARY AND DISCUSSION

Rural Residence as a Risk Factor for Multiple Hospitalizations

The results of this study indicate that rural NF residents are more likely to have multiple re-admissions from a hospital. This association is evident in all four states in this study and persists even after controlling for other factors, including state of residence and resident, facility and market-level characteristics. Further analysis indicates that the effect of rural residence on the probability of multiple NF re-admissions is strongest among newly admitted residents and is not significant among longer-term NF residents. In addition to rural residence, other factors associated with an increased odds of multiple NF re-admissions from a hospital include: state of residence, diagnosis of congestive heart failure, and no discharge planned at the time of admission. Residents classified in the “Rehab”, Special Care”, and “Clinically Complex” case mix groups all had a significantly greater likelihood of multiple NF re-admissions from a hospital. Older age (80+) and being in the “Cognitive” case mix group are associated with a lower likelihood of multiple hospitalization.

Conclusions, Policy Implications, and the Need for Further Study

The literature leaves little doubt that multiple hospitalizations of nursing home residents pose a significant health risks for residents. The findings of this study, therefore, raise important quality of care concerns. As Castle and Mor (1996) indicate in their review of the literature on

this topic, resolving the problem of nursing facility to hospital transfers is conceptually and methodologically complex and poses significant policy challenges. In addition to the problem of disentangling the many factors that contribute to this phenomenon, implementation of facility-level or policy remedies may be complicated by staffing shortages, the need for staff education and training, and/or the need for greater physician involvement and support for medically complex NF residents. Changing and sometimes conflicting Medicare and Medicaid payment and regulatory policies and incentives may also make solving this problem more difficult.

The patterns of findings from this and other research suggests that there are a number of key factors influencing the decision to hospitalize a nursing home resident, including the clinical capacity of the facility, the overall acuity of the facility's residents, and the individual characteristics of residents. In their recent study of nursing facility characteristics associated with the hospitalization of nursing home residents, Intrator and colleagues (1999) demonstrate that the presence of additional medical resources, either physicians or physician extenders, significantly reduced the risk of hospitalizations. This finding suggests a strategy of enhancing the availability and use of physician and other medical services to reduce hospitalizations (Garrard et al. 1990). Implementing such an approach in rural nursing homes, however, may be difficult. For example, the availability of qualified health personnel (e.g. geriatric nurse practitioners, RNs) has typically been a problem in many rural areas. Likewise, the limited availability of physicians in rural areas, their heavier workloads, and the limited reimbursement for care provided in nursing facilities will make it more difficult in rural areas to obtain greater physician attention to NF residents.

Expanded availability and use of video and computer-based technologies such as telehealth could be very useful in overcoming these limitations. Telehealth technologies can and are being used for home care and other applications that have the potential for enabling offsite diagnosis of medical and other problems, thereby reducing unnecessary emergency room use or hospitalization of LTC consumers (Cluff 1996). These technologies may have potentially useful applications in rural nursing homes (and other residential care settings) where access to specialty services is a known problem and likely contributor to the problem of hospitalizations.

The clinical and other characteristics of nursing facility residents are likely to continue to change as Medicare and state Medicaid programs move toward case mix-based payment systems for nursing facility care which encourage facilities to admit patients with heavier care needs. State efforts to restrict eligibility for nursing home care to those with the greatest medical

need and to create residential care alternatives, such as assisted living, and home and community-based service options for patients who might otherwise have been admitted to a nursing facility, will further contribute to these trends. For all of these reasons, it is critical that we understand better the challenges of, and potential strategies for, caring for medically complex residents in rural NFs. The latter might include greater use of geriatric nurse practitioners and other physician extenders, and increasing payments to physicians providing services in nursing homes (Freiman and Murtaugh 1995). The findings from this study suggest that it may be useful to target strategies for reducing the problem of nursing facility to hospital transfers to NFs located in rural places.

Provisions of the Balanced Budget Act of 1997 (BBA) and, and the Balanced Budget Refinement Act of 1999 (BBRA) and, specifically, the changes in Medicare payment policies for skilled nursing facilities and therapy services could have potentially important implications for the problem of hospitalizations among nursing home residents. The BBA mandated that HCFA implement a case-mix adjusted prospective payment system (PPS) for SNFs starting July 1, 1998. The PPS bundles nursing, therapy, and capital payments into one per diem amount. The target is to reduce what has been rapid growth in expenditures for therapy and ancillary services. The new payment system will be phased in over 3 years starting in 1998 using a blend of facility-specific and wage adjusted, federal base payment rates (Year 1=75% facility specific, Year 2=50%, Year 3=25%). In the shorter term, savings will be achieved by continuing the freeze on cost limits from 1994 and 1995 and using those in calculation of federal base payment rates. Payments will also be adjusted downward by 15% when FY 1999 PPS rates are calculated. The projected savings of all of these provisions for the period 1998-2002 are \$7.4B.

In response to concerns about access to SNF services for high acuity patients, Congress modified some of the BBA changes in SNF payment policy in the Balanced Budget Refinement Act of 1999 (BBRA). Specifically, Congress increased by 20% the per diem payment rates for selected high acuity case mix categories, including the Extensive Care, Clinically Complex, High Rehabilitation and Medium Rehabilitation groups. This legislation also set the annual increases in per diem rates for fiscal years 20001 and 20002 at 4%.

Notwithstanding the changes in the SNF payment rates made in the BBRA, there continue to be serious concerns about the ability of many skilled facilities to achieve the significant cost reductions required under the BBA and the impact that these reductions may have on SNF access and quality for Medicare beneficiaries. Smaller, rural SNFs may have a more limited

ability to absorb cuts in SNF payment without significant reductions in staff. Any staffing reductions would, of course, run counter to the need suggested by this and other studies for more, not fewer, clinical resources. Similarly, for some financially vulnerable rural hospitals which have diversified into SNF level care, cuts in SNF payments will be difficult to absorb and may result in reductions in staffing or other behavioral responses that could jeopardize the quality of care.

The bundling of therapy and other ancillary services that used to be paid out of Part B and which are now included in the per diem prospective rate could also contribute to the problem of hospitalizations of nursing home residents. Under the new payment arrangement, rural facilities will have to compete for these professional services with payment rates that may not be adequate in areas of low supply of these health professionals. Again, reductions in the availability of or access to these services will undermine efforts to improve and expand the clinical capacity of rural nursing homes.

Need for Further Research

This study leaves a number of unanswered questions regarding the clinical and other factors that may affect rates of multiple hospitalization of rural NF residents. Our findings regarding the effects of rural residence are sufficiently robust, however, to suggest the need for further research on this issue. Specifically, there are four areas that warrant further study.

Study Replication: An increasing number of states have computerized MDS nursing home resident assessment data which can be used to examine this and other quality of care related issues. Replication of this study in other states, and/or with national data (e.g. National Nursing Home Survey component of the Medical Expenditures Panel Survey (MEPS) would be helpful in determining the full extent of this problem. In addition to study replication, research that tracks and helps evaluate the effects of the new SNF PPS (and potentially other payment provisions in the BBA) will be very important.

Effects of Multiple Re-admissions on Health and Functional Status: The literature on this issue suggests that NF residents who experience multiple hospitalizations are at risk of a more rapid decline in health and functional status (Allman et al. 1994; Brandeis et al. 1994; Tresch, Simpson, and Burton 1985). Determining whether and to what extent health and functional status outcomes are poorer for rural NF residents as a result of higher rates of multiple NF re-admissions from the hospital warrants further study.

Barriers to Care in Rural NFs: We suspect, though do not fully understand how, multiple hospitalizations are influenced by characteristics of residents not captured in our case mix index, the ability and willingness of rural NF providers to care for certain conditions and/or types of residents, and public and private payment or regulatory incentives. It would be useful to have studies that examine patterns of care and hospitalization rates for nursing residents with specific high-prevalence conditions such as congestive heart failure, depression, or diabetes. Likewise, it would be useful to know whether staffing, staff training, the availability of specialty staff (e.g. geriatric nurse practitioners) and/or services affect hospitalization rates in rural nursing homes. The contributions of other structural or process of care characteristics of the rural NF also need to be better understood in order to determine why rural nursing homes have higher rates of multiple hospitalizations.

Cost: More research is needed to determine the monetary cost of hospitalizations that might be prevented if rural nursing facilities could provide a broader array of acute care services. Several studies claim significant Medicare and Medicaid savings per resident (\$1,614-\$3,000)

associated with care in the nursing facility versus hospital for “preventable” hospitalizations (Castle and Mor 1996; Kayser-Jones, Weiner, and Barbaccia 1989). Although defining “preventable” hospitalizations remains a challenge, there is little doubt that there would be cost savings if nursing facilities could avoid the hospitalization of some residents through expanded or improved medical care in the nursing home.

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**APPENDIX TABLE 1
NURSING FACILITY RESIDENT CHARACTERISTICS, ALL STATES**

	Mississippi			South Dakota			Maine			New York ¹						
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban				
All residents [N]	11,892	9,136	2,756	4,942	3,507	1,435	7,155	4,330	2,825	11,546	1,499	10,047				
Mean casemix index (Ind.)	1.08	1.08	1.08	1.05	1.03	1.10	a	1.17	1.15	1.20	a	1.20	1.15	1.21	a	
Mean case mix index (Facility)	1.07	1.07	1.07	1.04	1.02	1.09	a	1.16	1.15	1.19	a	1.20	1.14	1.20	a	
New admission	61.14	59.68	66.00	a	85.23	84.23	87.67	a	79.15	76.77	82.80	a	87.91	86.52	88.12	
Discharge planned 3 mo (%)	13.77	12.35	18.48	a	19.19	16.00	26.97	a	31.41	28.90	35.27	a	18.33	8.87	19.65	a
Capacity for improvement-self (%)	10.34	9.59	12.86	a	16.89	13.87	24.28	a	28.17	23.72	34.98	a	22.67	18.78	23.21	a
Mean age as of 1/1/94	79.86	80.21	78.70	a	80.79	81.26	79.65	a	79.42	79.81	78.81	a	80.39	81.15	80.27	a
Female (%)	70.20	69.52	72.45	a	64.53	63.93	65.99		67.42	67.51	67.28		68.34	67.85	68.41	
Married (%)	20.42	20.42	20.44		29.25	28.41	31.29	b	26.56	26.07	27.30		19.04	16.88	19.36	b
White (%)	73.39	72.32	76.98	a	95.65	95.43	96.21		98.27	98.02	98.64		87.59	94.40	86.57	a
Mean number of diagnoses	3.70	3.76	3.47	a	3.46	3.45	3.46		3.76	3.80	3.70	b	3.77	3.91	3.75	a
Mean # ADLs requiring assistance	4.51	4.56	4.35	a	4.02	3.96	4.16	b	4.66	4.67	4.65		4.56	4.67	4.54	b
Mean CPS score	2.46	2.51	2.27	a	1.89	1.88	1.90		2.29	2.34	2.20	a	2.20	2.31	2.18	b
CHF (%)	24.60	25.62	21.19	a	26.55	28.11	22.73	a	22.27	24.05	19.53	a	20.02	24.68	19.32	a
Hip fracture 180 days (%)	4.79	4.38	6.16	a	5.52	5.32	6.01		8.02	7.71	8.48		9.50	6.91	9.86	a
With pressure ulcers (%)	16.78	17.09	15.78		9.96	9.72	10.52		15.78	15.17	16.71		21.25	17.61	21.80	a
Impaired hearing (%)	1.98	1.90	2.25		1.42	1.26	1.83		2.77	2.67	2.92		1.57	2.07	1.50	
Impaired vision (%)	3.71	3.79	3.47		2.09	2.00	2.32		3.22	3.58	2.67	b	3.05	3.19	3.03	
Verbalized distress (%)	11.03	12.05	7.64	a	24.04	20.46	32.82	a	23.01	22.71	23.47		12.75	11.75	12.91	
Avoiding interaction (%)	1.96	1.68	2.85	a	2.99	2.58	3.99	a	4.42	4.96	3.59	a	1.49	1.07	1.56	
Case Mix Groups:																
Rehab (%)	12.24	10.07	19.45	a	9.92	6.76	17.63	a	28.86	24.16	36.07	a	36.36	23.22	38.32	a
Extensive care (%)	2.58	2.81	1.81	a	1.30	1.25	1.39		1.41	1.62	1.10		1.47	1.47	1.47	
Special Care (%)	13.71	14.54	10.96	a	11.96	11.95	11.99		7.52	7.88	6.97		7.72	8.54	7.59	
Clinically Complex (%)	29.94	31.18	25.83	a	41.24	42.51	38.12	a	31.00	33.44	27.26	a	30.07	34.02	29.48	a
Cognitive (%)	10.68	11.21	8.93	a	10.91	11.80	8.71	a	10.82	11.18	10.27		8.20	10.21	7.90	a
Behavior (%)	0.67	0.61	0.87		0.61	0.68	0.42		0.49	0.51	0.46		0.36	0.40	0.36	
Physical (%)	27.12	27.80	24.85	a	24.08	25.04	21.74	b	18.66	19.82	16.88	a	15.72	22.15	14.76	a
Not Assigned (%)	2.61	1.29	6.97	a	0.00	0.00	0.00		0.84	0.74	0.99		0.10	0.00	0.11	

¹ Excluding NYC

^a p < .01

^b p < .05