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DIFFERENCES IN NURSING HOME DISCHARGE RATES
FOR URBAN AND RURAL
NURSING FACILITY RESIDENTS WITH HIP FRACTURE

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FOR URBAN AND RURAL NURSING FACILITY RESIDENTS
WITH HIP FRACTURE**

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EXECUTIVE SUMMARY

Prior studies have demonstrated significant differentials in the availability and use of home health and other rehabilitative services by rural residents. To what extent do these differences affect nursing home discharge rates for patients needing short-term rehabilitation? This study examines this question using a cohort of rural and non-rural residents newly admitted to nursing home care following hip surgery. The study sought to determine whether and how rural residence, and the long term care service supply characteristics commonly found in rural communities, affect nursing home discharge rates.

The study results indicate that rural residents who are hospitalized for hip fracture and subsequently placed in a nursing facility for a period of rehabilitation are significantly less likely than non-rural residents to be discharged within the first 30 days of their nursing home stay. Rural residents who stay beyond 30 days are also less likely to be discharged in the first six months of their stay. The magnitude of these differences is significant, with discharge rates among rural nursing facility residents averaging one-half to one-thirds lower than among non-rural residents. These geographic differences are not explained by service use and resident characteristics, such as age or health and functional status alone. Furthermore, the effects of the supply of home health-based physical therapy on rates of discharge appear to be more complicated than originally thought.

The findings of lower discharge rates among rural residents are consistent with the pattern of findings from previous research showing higher rates of nursing home use among rural residents. The personal and economic costs for consumers and for the health care system of higher nursing home use among the rural elderly may be considerable. Although this and other studies demonstrate the greater risk of longer term institutionalization among the rural elderly, research to date has been unsuccessful in identifying the factors contributing to higher nursing home use rates in rural populations and areas. There continues to be a need for a better understanding of the role that service supply and accessibility play in the patterns and outcomes of rural long term care.

INTRODUCTION

There has been growing concern among policymakers and rural health advocates that the expanded availability and use of rehabilitative, in-home health, and social support services for older persons may be bypassing rural America. Despite rapid growth in the Medicare home health program and expansion of Medicaid and state funded home care programs, there is evidence of significant differentials in the availability and use of these services by rural residents (Coward et. al 1994; Krout 1994; Kenney 1993; Dubay 1993; Kenney and Dubay 1993; Nelson 1994). Limited access to community-based long term care services in rural areas reflects the more general problem of service availability and capacity in many rural locales. In the case of home health services, in particular, access problems may be related to the availability of agencies, the ability of agencies to recruit specialized staff (e.g. physical therapists), and the higher cost of services due to longer travel times in many rural areas.

The consequences for older rural residents of these problems is not known. One observer (Greene 1984) has suggested that the lack of in-home, long term care services may be resulting in premature and unnecessary nursing homes placements. More recent research, however, found no differences among rural and urban residents in their use of formal community based long term care services prior to nursing home admission (Coward et al. 1994). Kenney and Dubay (1993), on the other hand, found significant differences among rural and urban Medicare beneficiaries in their use of Medicare home health services. Among the most interesting findings of this study were

the striking differences in the composition of services and visits among rural and urban beneficiaries. Although rural residents were less likely to use services, rural users had more visits. Rural residents were much more likely than urban residents to receive either skilled nursing or home health aide services, but significantly less likely to receive speech or physical therapy services. This finding confirms the results of other research showing that rural home health agencies are less likely than their urban counterparts to have these more specialized therapy services (Kenney 1993). It is also consistent with studies indicating that rural communities are most deficient in their ability to offer more specialized services that may be needed by residents with significant disabilities (Coward and Cutler 1989).

Although differences in access to home health services among rural and urban residents are an important issue for policymakers, access problems are especially compelling if they affect the outcomes and cost of care. With the general research on the problems of long term care availability and access in rural communities as a backdrop, this study sought to determine whether and how rural residence, and the service supply and access characteristics commonly associated with rural communities, affect the patterns of care for users of the long term care system. To examine this question, we chose to study the nursing home discharge outcomes for a cohort of older persons for whom the availability and use of nursing home, home health, and other community-based long term care would be expected to result in significant functional and health improvements: older persons with hip fracture.

Hip fracture is a common hospital admitting diagnosis among older persons, representing approximately one percent of all Medicare admissions in 1990. It is also among the most common reasons for subsequent admission to skilled nursing facilities for post-acute care (Dubay 1993). The majority of older patients with hip fracture are discharged from the hospital and/or nursing facility following a period of convalescence and rehabilitation. Studies indicate, however, considerable variation in nursing home length of stay, patient status changes, discharge rates to independent living arrangements, and other outcomes for community-residing elders following hospitalization for hip fracture (Bonar et al. 1990; Ensberg et al. 1993; Keil et al. 1994).

This study explores two primary questions which have not been addressed in prior research:

- Do the discharge rates to lower care settings for older adults receiving post-hospital care in a nursing facility for hip fractures vary by urban and rural residence?
- To what extent are discharge rates related to:
 - the health, functional status and characteristics of urban and rural residents?
 - the socio-demographic and social support characteristics and needs of rural and urban residents? and
 - the availability of in-home nursing and rehabilitation services in rural and urban markets? and
 - the characteristics of rural and urban nursing home markets.

If there are differences in discharge rates, understanding the reasons for those differences is critical for framing policy or service interventions. The effects of home health service supply, and, in particular, the availability of physical therapy services, to the course and outcomes of care for rural residents are of particular interest in this study. The effects of home health service supply and access must be considered, however, in light of other equally important factors such as the underlying health and functional status of rural versus urban elders and the characteristics of rural and urban nursing facilities.

METHODS

Data Sources

Data for this study were obtained from five principal sources: (1) the Maine Uniform Hospital Discharge Data Set, (2) the Maine Nursing Home Resident Assessment File, (3) the state's Nursing Facility File, (4) a telephone survey of Medicare certified home health providers, and (5) Medicare home health cost reports.

Maine Hospital Discharge File: Data from the Maine Uniform Hospital Discharge Data Set (UHDDS) were used to identify all persons discharged from Maine hospitals between 7/1/1992 and 6/30/1994 with a diagnosis of hip fracture (n=2,800). The UHDDS contains patient-level data for each discharge from an acute care or specialized rehabilitation facility in Maine. Discharge data in the UHDDS include: patient demographics (date of birth, gender, race, town, county, state, and zip code of home address); diagnoses (ICD-9 code); DRG grouping for the patient's stay; procedures

performed during the stay (ICD-9); physician's name; admission and discharge dates; reported discharge destination (home, nursing home, other hospital), and expected source of payment.

Maine Resident Assessment (RAF) File: The RAF file contains data on all individuals cared for in Maine nursing homes (n= 145), as described by the MDS+ (minimum data set, plus). The MDS is a national, federally prescribed, resident assessment system that has been developed and implemented by the states with extensive testing (Morris et al. 1990). Data collected on the MDS+ include: the resident's date of admission, demographic profile, health care needs, current health and functional status, cognitive status, and indicators of psycho-social well-being. The MDS + instrument was adopted by Maine in October 1 990 and includes all resident assessment items contained in the federally mandated MDS for compliance with implementation of the Nursing Home Reform Act (OBRA 1987). Supplemental data on medications and rehabilitation services (defined and established for states participating in the federal HCFA Case Mix Demonstration Project) are also contained in the instrument. Resident assessments using the MDS + are completed by nursing facility staff at the time of resident admission, and at least quarterly thereafter. Additional assessments are conducted when significant changes occur in a resident's health status or care needs. Data on resident discharge, including date of discharge and discharge destination, are drawn from the MDS + Discharge Log file.

Nursing Home Characteristics: State data on nursing home characteristics, including ownership, chain or hospital affiliation, bed size, and geographic location, were abstracted from the state Nursing Facility File.

Home Health Supply: No existing state data source provided sufficient information to describe the supply and distribution of home health agency services or physical therapists' services. Data used to characterize the availability of in-home physical therapy services in Maine were obtained through (1) telephone surveys of home health agencies (n=42, 87% response rate) and independent practice physical therapists (n=41, 89% response rate) and (2) the Medicare Home Health Cost Reports. The telephone surveys gathered information on each provider's service area, primary location of service delivery (in-home or office setting), and whether nursing and physical therapy services were readily available through home health agencies within each town of the agency's service area. Federal Medicare cost reports were used to obtain information on both contract and staff full-time equivalent physical therapists.

The Sample

The sample frame included 2,415 Maine residents aged 65 or older who had hip fractures (ICD-9 Code 820.xx, hip fracture) and who were discharged from Maine hospitals during a two year period (July 1992 through June 1994). For purposes of the analyses reported here, only those individuals with a primary diagnosis of hip fracture who received surgical procedures for repair of hip fracture or total or partial hip replacement (excluding revision of hip replacement) are included. Of those

excluded, reasons for exclusion included hip fractures secondary to malignancy or other diagnosis, primary diagnosis of hip fracture without surgery, and out-of-state residence.

Of the 2,415 persons discharged from Maine hospitals following hip surgery, 1,030 (42.7%) were discharged home, 305 (12.6%) patients went to other hospitals (including rehabilitation hospitals), 94 (3.9%) patients died, and 986 (40.8%) patients went to a nursing facility (NF).¹

For purposes of sample construction, nursing home resident assessments were matched with hospital discharge data using a probabilistic matching algorithm which was operationalized using AUTOMATCH software.² Resident assessment data were drawn from the file containing all assessments conducted on all Maine nursing home residents during the period January 1992 through December 1994 (n = 28,329). Criteria used for defining a match between hospital discharge and nursing home resident assessment records included: hospital discharge and nursing home admission dates (varying by no more than 2 days in the least restrictive match definition); gender; race; date of birth, (permitted to vary by no more than 2 characters in the least restrictive definition); diagnoses, and home residence zip code.

The final sample included only the 573 nursing facility residents with initial nursing facility admissions following hospitalization for hip surgery. The decision to exclude persons being readmitted to nursing facility care following hospitalization for hip surgery was based on documented differences in hospital and nursing facility care

outcomes in the literature (Ensberg et al. 1993; Magaziner et al. 1989). This concern was confirmed by our own findings of significant differences in the age distribution of these two nursing home cohorts (i.e. newly admitted post-hip surgery versus NF residents readmitted following surgery).³ An additional 15 potential sample members were dropped from the analyses based on excessive hospital lengths of stay (greater than 60 days), an occurrence suggesting other than a routine hip-surgery hospital stay.

Analytic Approach and Study Variables

Following descriptive analyses of patient characteristics, service use, and outcomes, bivariate analyses of hip fracture patient characteristics were conducted to consider geographic differences between patients from rural and more urban regions within Maine. Thereafter, multivariate COX proportional hazard analyses were used to estimate residents' rate of discharge to lower care settings within 30 days (short term discharge rate) and between 31 and 180 days (longer term discharge rate), controlling for resident characteristics, service use, and area service supply characteristics (Cox 1972).

The Model

The conceptual model for testing the effects of rural residence and area service supply characteristics on the rate of discharge to lower care settings can be summarized by the statement:

Rate of discharge to lower care = f (residence, resident sociodemographic, health, and functional status characteristics at admission to nursing facility following hip surgery, service use, and area service supply).

Study variables are discussed below and summarized in Table 1.

Dependent Variables

Discharge Rates: The rate of discharge from a nursing facility to a lower level of care-- *discharged home or to a non-medical residential care facility (board and care)*-- is the principal dependent variable used in this study. Rates of discharge are defined using a denominator reflecting all residents at risk for discharge during any part of the time period of interest. Separate models were estimated for two time periods. The first model considers discharge rates during the interval beginning on the day of admission through 30 days post-admission to an NF (referred to as “short term” discharge rate); the second model considers rates of discharge for the period 31 to 180 days post-NF admission (the “longer term” discharge rate).⁴ Crude discharge rates were operationalized as the ratio of NF length of stay (days of care) for residents discharged to lower care settings during the time period of interest, divided by total days of care for all sample members during that same interval.

Explanatory Variables

Residence: The individual nursing home resident is the unit of analysis in this study and, therefore, each resident’s home address is classified as either rural or non-rural. Traditional ways of distinguishing rural from urban areas do not work very well in

Variable Definitions, Measurement, and Data Sources			
Variable	Measurement	Definition	Data Source
Dependent Variables:			
N F-LOS (Short) NF-LOS (Long)	Days Days	Nursing Facility Length of Stay, 1 st 30 days post-admission Nursing Facility Length of Stay, 31-1 82 days post-admission	MDS + MDS +
Censoring Variables (Lower Care Home or Board & Care):			
Discharge < 31 days	Dichotomous, 1 =	Discharged to Lower Care within 30 days	MDS+
Discharge > 30 days	Dichotomous, 1 =	Care within 6 months	MDS +
Independent Variables:			
<i>Residence:</i>			
Residence	Dichotomous, 1 =	Home in Rural Area	UHDDS & Hospital Area Files
<i>Resident Characteristics:</i>			
Age	Years	Age	MDS +
Gender	Dichotomous, 1 =	Male	MDS+
Lives Alone	Dichotomous, 1 =	Lives Alone	MDS +
ADL Limitations	Score (4 to 18)	Baseline ADL Dependence ¹	MDS +
Cognitive Status	Score (0 to 6)	Baseline Cognitive Status ²	MDS +
Self Perception	Dichotomous, 1 =	Self-perception: Able to Improve	MDS +
<i>Service Use:</i>			
PT Within 7 Days	Dichotomous, 1 =	Received Physical Therapy within 7 Days of Initial Assessment	MDS +
Hosp. LOS	Days	Hospital Length of Stay	UHDDS
<i>Area Service Supply:</i>			
Hospital Affiliation	Dichotomous, 1 =	Nursing Facility is Hospital-Affiliated Facility	MDS÷ & Licensure Data
Home Health/PT Supply	Ratio	Full-time Equivalent Physical Therapist/i 000 Pop. 65 +	Home Health Cost Reports/Survey Licensure Data
NF Bed Supply	Ratio	Nursing Facility Beds/i 000 Pop. 65 +	

The ADL score reflects the sum of values reported for self-performance of late loss ADLs (eating, toileting, bed-mobility, and transferring). Higher values reflect greater levels of dependence.

² The Cognitive Performance Scale (Morris, et al. 1994) measures the number and degree of cognitive impairments using MDS+ variables for comatose status, capacity for independent decision making, ability to make self understood, short term memory, and dependence in eating. Higher values reflect greater impairment.

Maine for several reasons. The three Census-defined Metropolitan Statistical Area (MSAs) in the state do not include several cities and/or urbanized areas that do not possess the characteristics of rural areas. The sixteen Maine counties, on the other hand, are too large and geographically diverse to use as the unit of analysis. For example, Maine's largest county covers more area than the entirety of several other New England states; in several of the state's northern counties, 40%-75% of the land area consists of "unorganized territories" with average population densities of less than 1 person per square mile.

In order to develop a classification scheme which more accurately reflects the geographic diversity in the state, each resident was assigned to one of the 31 designated Hospital Analysis Areas (HAAs) based on their town of residence. HAAs were designated as either rural or non-rural based on total population and population density. Rural HAAs were defined as either having a total population of less than 50,000 or a population density of less than 50 people per square mile. HAAs classified as 'non-rural' had a total population of at least 50,000 or an average of at least 50 people per square mile. These definitions have the effect of counting as non-rural, cities/areas such as Biddeford/Saco, Bath/Brunswick, Augusta, and Waterville, all of which are urbanized, but do not fall within an MSA.

Resident Characteristics: A variety of socio-demographic, health and functional status characteristics of persons with fractured hips have previously been identified as

significant predictors of hospital discharge to home, earlier nursing home discharge to home, and more positive health outcomes, including:

Age - more positive outcomes occur among younger persons (Williams et al 1994; Ensberg et al. 1993; Ceder et al. 1980);

Gender - men tend to have more negative outcomes than women with higher rehospitalization rates (Kiel et al. 1994);

Dependence on others in the performance of activities of daily living and/or mobility - persons who are less dependent experience more positive outcomes (Kiel et al. 1994; Williams et al 1994; Ensberg et al. 1993; Bonar et al. 1990; Ceder et al. 1980);

Level of cognitive impairment - persons with cognitive impairments tend to have less positive outcomes (Kiel et al. 1994; Marottoli et al. 1994; Ensberg et al. 1991; Magaziner et al. 1989; Ceder et al. 1980);

Residents' mood or self-confidence - positive affect and self-confidence are associated with positive outcomes (Williams et al 1994; Borkan and Quirk 1992; Mossey et al. 1989; Lewis et al. 1985; Nickens 1983); and

Availability of social support or living with others - persons who have family or other active informal support networks are more likely to have positive outcomes (Kiel et al. 1994; Williams et al 1994; Ensberg et al. 1993; Bonar et al. 1990; Ceder et al. 1980).

Measures of these characteristics, as described in Table 1, are included in our analytic models.

Service Use: Positive post-hip surgery outcomes have also been shown to be associated with early ambulation and involvement in physical therapy (Bonar et al. 1990) and hospital length of stay (Williams et al. 1994). For this analysis, the indicator of early involvement in physical therapy reflects physical therapy received during the week prior to the admission assessment conducted at the nursing facility.

This measure describes use of physical therapy only, and does not consider the location or provider of physical therapy services. Hospital length of stay is defined here as the number of days of hospital care received during the hospital episode associated with hip surgery.

Area Service Supply:

Home Health Physical Therapy (PT) Services: Developing an adequate measure of home health supply represented a significant challenge as indefinite and overlapping home health agency service areas make it difficult to allocate agency-specific supply to geographic areas. The home health PT supply variable used in this study measures the average **full-time equivalent home health physical therapist availability** (PT-FTE) for each town of residence for the study population. Because we were most interested in in-home health services, this home health supply variable includes only data on PT services provided by certified home health agencies; independent PTs are excluded based on telephone survey findings indicating that they generally do not provide services in clients' homes.

Due to the lack of information on actual home health PT-FTE services by town, it was necessary to allocate PT- FTEs per town. Each certified home health agency in Maine provided information on the specific towns in which they provided PT during the study period. These data were merged with cost report data on the agency's full-time equivalent PT capacity, including both staff and contracted PTs, used by the agency during the study period. This allocation of each agency's PT FTE capacity was

premised on the unavoidable assumption that each town receiving services from an agency had equal access to PTs employed by the agency, hence permitting allocation of PT-FTE time based on each town's share of the total population aged 65 and older within the agency's service area.

The home health PT supply analyses described here exclude residents (n = 33) of two southern Maine HAAs which border New Hampshire (York and Sanford) and are known to be served by New Hampshire-based certified home health agencies for which we had no home health PT supply information.

The measure of home health PT supply used here is imperfect in several respects. First, the allocation of PT FTEs to towns reflects a theoretical capacity to serve a town without regard to factors such as distance or demand. Moreover, the measure does not measure the accessibility of PT services at the town or small area level. As a crude measure of relative supply, however, it goes considerably beyond other measures found in the literature. The development of new and more accurate methods for measuring supply was beyond the objectives and resources of this study but represents an important need for future research (Fortinsky and Spector 1996).⁵

Nursing Home Services: Nursing facility (NF) occupancy rates have been shown to be predictors of health outcomes among persons with hip fractures (Torres-Gil and Wray 1993; Fitzgerald, Moore and Dittus 1988). In the absence of data on area NF occupancy rates during the study period, characteristics of nursing facilities, specifically, *affiliation with an acute care hospital and area nursing home bed supply,*

are included in the model as proxies to control for area NF supply and, indirectly, competition.

FINDINGS

Discharge Status and Length of Stay:

Table 2 presents a geographic comparison of the sample's discharge status, individual resident characteristics and service use, and area service supply. Discharge from nursing facilities to lower care settings within 30 days are lower among rural residents than non-rural residents (28% versus 35%, respectively, $p < .10$). Similarly, the proportion of rural residents discharged to lower care settings during the remainder of the 6 month post-admission period is significantly lower among rural than non-rural residents--49% versus 59% respectively ($p < .05$). It follows that average nursing home length of stay during the first 30 days and in the next 6 months following admission to an NF was also significantly longer for rural residents compared with non-rural residents.

Resident Characteristics: Rural and non-rural residents' demographic and health status characteristics differed with regard to age and limitations in physical functioning. Rural residents were slightly older than their non-rural counterparts (84.2 versus 82.9; $p < .07$) and rural residents were more dependent on others for assistance with activities of daily living (ADL scores 11 .9 and 11 .2, respectively, $p < 0.03$). Rural and non-rural residents did not differ on other socio-demographic or health status characteristics.

TABLE 2
Comparison of Rural-Non-Rural NF Residents'
Discharge Status, Characteristics, Service Use, and Area Service Supply Post-Hip Surgery

	RURAL n = 181		NON-RURAL n = 359		TOTAL SAMPLE n = 540	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
DISCHARGE STATUS						
NF Discharge = 30 Days***	0.28	0.45	0.35	0.48	0.33	0.47
NF Discharge 31-181 Days**	0.49	0.50	0.59	0.49	0.55	0.50
NFLOS(Short)**	25.45	7.37	23.80	8.24	24.36	7.99
NFLOS(Long)*	59.00	67.33	40.57	58.75	46.75	62.31
RESIDENT CHARACTERISTICS:						
Age***	84.15	7.24	82.93	7.42	83.34	7.37
Gender	0.18	0.39	0.22	0.41	0.21	0.41
Lives Alone	0.48	0.50	0.44	0.50	0.45	0.50
ADL Limitations**	11.85	3.40	11.18	3.44	11.41	3.43
Cognitive Status	1.62	1.65	1.57	1.67	1.59	1.66
Self-Perception	0.53	0.50	0.54	0.50	0.54	0.50
SERVICE USE:						
Received PT within 7 Days*	0.46	0.50	0.60	0.49	0.55	0.50
Hospital LOS	14.60	8.91	14.03	8.81	14.22	8.84
AREA SERVICE SUPPLY:						
Hospital Affiliation	0.23	0.42	0.20	0.40	0.21	0.41
NF Bed Supply	64.30	20.63	62.66	15.88	63.21	17.61
Home Health/PT Supply*	0.18	0.13	0.77	0.76	0.58	0.69

* p=.01
** p=.05
*** p=.10

Service Use: Residential differences in the proportion of residents receiving PT early in their convalescence were significant, with rural residents less likely to have received care than non-rural residents ($p < .01$). The length of hospital stay did not differ significantly among rural and non-rural residents.

Area Service Supply: Home health PT supply was significantly lower in rural than non-rural communities ($p < .01$). On average, the supply of PTs was over three times lower in rural compared to non-rural communities (.18 versus .76). This finding is consistent with previous findings of geographic differences in the availability of specialized home health services (Kenney 1993; Coward and Cutler 1989). There is significant variation in supply rates within each category of towns, however, as indicated by the large standard deviations in rates in both rural and non-rural areas.

The ratio of nursing home beds to older adult population, while higher in rural communities than in non-rural communities, did not differ significantly across geographic regions. Nor were significant geographic differences found in the frequency of residents receiving care in a nursing facility affiliated with an acute care hospital.

Crude Discharge Rates: Estimates of crude discharge rates for rural and non-rural NF residents (not controlling for resident characteristics, service use, or area service supply) show significant residential differences in the rate of discharge to lower care settings following nursing facility care post-hip surgery (Table 3). The short-term rate of discharge to a lower care setting is nearly 25% lower for rural residents than for

non-rural residents ($p < .05$), and over 60% lower for rural residents in the longer term ($p < .01$).

MULTIVARIATE ANALYSES OF DISCHARGE RATES

Proportional hazard models were used to estimate the effects of residence, socio-demographic and health/functional status, service use, and area supply characteristics on short term and longer term rates of NF discharge to lower care settings following post-hip surgery care. Alternate model testing (not all reported here) demonstrated the consistent stability of both the direction and significance of the predictive effects discussed below. Additional information on alternate specifications of the model and diagnostics are available from the authors.

TABLE 3
Crude NF Discharge Rates by Residence

RESIDENCE	Discharge Rates per 100 Days	
	Short Term (<31 Days)	Longer Term (>30 Days)
Rural	0.80*	0.35**
Non Rural	0.99	0.58
TOTAL	0.93	0.48

^a Rates are calculated as follows: hip fracture resident discharges to lower care setting within 30 or 180 day period/total hip fracture resident days within 30-180 day period

* $p < .05$ (rural, non-rural comparison)

** $p < .01$

Rural Residence: Short and longer term NF discharge rates are lower among rural residents (Table 4). The estimates in Tables 4 indicate that, even after controlling for differences in resident characteristics and other variables, the short term discharge rates (within 30 days) were one-third lower for rural residents than non-rural residents

TABLE 4

Proportional Hazards Models of Short-term and Longer-term Nursing Home Discharge Rates

Variable	Short-term (<31 days)		Longer-term (31-180 days)	
	RRatio	95% CI	RRatio	95% CI
Residence	0.66**	0.46-0.96	0.54***	0.34-0.85
Sociodemographics				
Age	0.97***	0.95-0.99	0.99	0.97-1.02
Gender	0.74	0.50-1.11	1.11	0.70-1.77
Lives Alone	0.72**	0.52-.099	1.14	0.78-1.65
Health/Functional Status				
ADL Limitations	0.79***	.75-0.83	1 .00	0.95-1.07
Cognitive Status	0.86**	0.75-0.99	0.69***	0.60-0.81
Self-Perception	1 .86***	1 .28-2.70	1 .69***	1.16-2.48
Service Use:				
PTWithin7 Days	2.01***	1.34-3.07	1.84***	1.23-2.77
Hospital LOS	0.95***	0.92-0.97	0.99	0.97-1.01
Area Service Supply				
NF Hospital Affiliation	2.73***	1.95-3.82	0.85	0.46-1.60
NF Bed Supply	1 .00	0.99-1 .01	1 .06	0.99-1 .02
Home Health/PT FTE	0.65***	0.47-0.90	1.06	0.80-1.42

-2 LogL = 243.5, 12 D.F. (p=.0001) 70.7, 12 D.F. (p=.0001)

- * p<.10
- ** p<.05
- *** p<.01

(RR: .66; CI: .46-.96). Longer-term discharge rates among rural residents were nearly half those of non-rural residents (RR: .54; CI: .34-.85).

Socio-demographic Characteristics: As would be expected from previous research, discharge rates during the first month of NF stay were significantly lower for older residents (RR: .97; CI: .95-.99) and for residents who lived alone prior to NF admission (RR: .72; CI: .52-.99). These variables were not, however, significant predictors of discharge in the longer-stay models.

Health/Functional Status: Shorter stay discharge rates were significantly lower among residents with greater dependence in activities of daily in living (RR: .79; CI: .75-.83) and among those who had greater cognitive deficits at the time of admission to the NF from the hospital (RR: .86; CI: .75-.99). In contrast, residents with higher expectations of their capacity to gain greater independence in ADL had significantly higher short-term discharge rates (RR: 1 .86; CI: 1 .28-2.70). -

Both residents' cognitive status (RR: .69; CI: .60-.81) and self-perception of ability to improve (RR: 1 .69; CI: 1 .1 6-2.48) were significant predictors of longer-term discharge rates. ADL limitations was not a significant predictor of longer-term discharge rates.

Service Use: NF residents who had shorter hospital stays (RR: .95; CI: .92-.97) and those receiving physical therapy during the seven days preceding their initial assessment in the NF (RR: 2.01; CI: 1 .34-3.07) had significantly higher rates of discharge to lower care settings within thirty days of NF admission than did persons with longer hospital stays or residents who did not receive physical therapy during the period immediately preceding NF admission assessment. Only the positive effect of early physical therapy use remains significant in the explanation of longer term discharge rates (RR: 1 .84, CI: 1 .23-2.77), suggesting that the effects of hospital length of stay on discharge rates dissipate over time.

Other measures of health service use considered in earlier models (not reported here) included receipt of active or passive range of motion exercise program at the

time of initial NF assessment, numbers of medications used, and use of anti-depressants. None of these factors were significantly associated with rates of discharge.

Area Service Supply Effects on Discharge Rates: One of the important questions in this study is whether and how the supply and accessibility of physical therapy services may affect short and longer term discharge rates from the nursing home for hip fracture patients. The results in Table 4 indicate a significant, negative association between PT supply and short term discharge rates (RR: .65; CI: .47-.90); PT supply is not significant in the longer-term model. The negative parameter estimate here, indicating that lower supply rates are associated with higher short-term discharge rates was unexpected and is discussed in the next section. In addition to PT supply, NF affiliation with a hospital was significantly associated with higher short-term discharge rates (RR: 2.73; CI: 1 .95-3.82); this variable was not significant in the longer-term model. Nursing home bed supply rates in the area were not significant predictors of either short or longer-term discharge rates.

DISCUSSION

The results of this study indicate that rural residents who are hospitalized for hip fracture and subsequently placed in a nursing facility for a period of rehabilitation are significantly less likely than non-rural residents to be discharged within the first 30 days of their NF stay. Among those who stay beyond 30 days, rural residents are also less likely to be discharged in the first six months of their stay. These findings are not

explained by resident characteristics, such as age or health and functional status or service use.

To understand better the underlying nature of geographic differences in discharge rates, we explored the hypothesis that area supply characteristics, reflecting the availability, and presumably accessibility, of rehabilitative services such as physical therapy, would be a predictor of whether, and how early, residents would be discharged from the nursing home following hip fracture surgery. Although home health physical therapy supply rates are substantially lower in rural than non-rural communities in Maine, our multivariate results show that residents from areas with lower PT supply rates had higher discharge rates. These findings were unexpected and are counterintuitive. If these estimates reflect actual effects, several interpretations are possible. Although home health PT services are less available in rural communities, substitution of other services may not only obviate any disadvantage, but may actually foster higher discharge rates for some residents. Our measure of supply reflects only available capacity and does not capture how that capacity is actually deployed to serve nursing home residents either in the facility or at home after they leave. It may be that nursing facilities in areas of low supply are more likely to contract with home health agencies for PT services and provide earlier, more intensive rehabilitative services that lead to earlier discharge. It may also be possible that the productivity of the available supply is higher in low supply than higher supply areas.

Although we must entertain the possibility that this finding is correct, we are inclined to believe that measurement error and miss-specification of our model are the most plausible explanations for these findings. The method used to construct the measure of home health PT supply is the principal source of potential measurement error. As indicated in our discussion of study, this method allocates FTE equivalent PT staff employed by home health agencies in Maine to individual towns assuming a uniform availability of home health PT staff across geographic areas. No adjustments are made for key factors that may differentially affect access in rural and non-rural areas to home health-based PT services such as distance, travel times, or other potential service barriers. Notwithstanding the results of these multivariate analyses, the bivariate results of this study, indicating lower discharge rates among rural residents and lower PT supply rates would seem to suggest that further research on the relationship of service supply characteristics and discharge rates is warranted.

A more serious limitation of the approach used here may be the potential miss-specification of our analytic model. Although our interest in this study is with the role that the availability and accessibility of in-home rehabilitation and supportive services may play in influencing nursing home discharge rates, data limitations have constrained our model to an assessment of the impact of PT service supply. In all likelihood, however, the availability of PT services may not be the most critical factor in determining whether a nursing home resident with hip fracture can be discharged in a timely manner. Homemaker and chore services, personal care and other social and

personal support services, which were not included in this study, may be more critical in influencing whether and how soon a resident can be discharged. The resident's social circumstances, including the availability of family and friends to provide supportive care, may also be critical. The care received in the nursing facility in the course of a resident's stay may also be determinative of discharge rates and outcomes. This study did not attempt to examine the availability and use of rehabilitation and other services, discharge planning practices and barriers, and/or other factors related to the care received in the nursing facility. And finally, consumer preferences for institutionally-based versus in-home services on the part of the older person or their family are not considered in this study. In the case of most of these factors, we have prior research indicating significant residential differences along these dimensions.

Findings from this study generally support previous research results indicating that residents' socio-demographic and health and functional status characteristics, such as age, ADL dependency, cognitive status, whether a person lives alone, and patients' expectations for improvement, are all important factors in affecting the prognosis for hip fracture patients who are admitted to the nursing home post-hip surgery. While intuitively appealing, the positive effects on discharge rates of shorter hospital stay and early PT use must be interpreted with caution. As crude measures of service use, it is possible these indicators are capturing variability in individual residents' health that are not reflected in the measures of functional dependence or

cognitive impairment used in this model. For example, although efforts were made to exclude persons from the sample who had hip surgery for palliative care rather than restorative purposes (such as hip surgery for terminally ill cancer patients), differences in medical record coding practices of hospitals may have resulted in patients targeted for exclusion remaining in the study sample. In this instance, both hospital length of stay and not receiving PT at the time of initial NF assessment may be explaining individual patient differences rather than the effects of service use on rates of discharge to a lower care setting within one month of admission. Other features of post-surgery care influencing short term discharge rates, particularly receipt of services in a hospital affiliated nursing facility may reflect either selection of post-surgery patients with the greatest rehabilitation potential or differences in service quality.

And finally, it is important to note that these findings suggest that the effects of a number of these factors, such as age, ADL dependency, and whether the resident lives alone, appear to be time sensitive. While significant predictors of discharge rates in the first 30 days of an NF stay, they do not appear to be related to discharge rates in the longer term. This research further confirms the previously reported importance of resident self-perception and the positive effects of physical therapy services early in the post-hip surgery rehabilitation care process. Again, additional research is needed to understand these effects.

CONCLUSIONS AND POLICY IMPLICATIONS

The findings of lower short and longer-term nursing facility discharge rates among rural residents is consistent with the pattern of findings from previous research showing higher rates of nursing home use among rural residents. The magnitude of these differences is significant, with discharge rates among rural nursing facility residents averaging one-half to one-third lower than among non-rural residents. This study examined discharge rates for one cohort of hospitalized patients-those with hip fracture; similar patterns of nursing home use may apply for others for whom short term rehabilitation and supportive services may be needed for convalescence and return to independent living.

The observed differences in discharge rates raise a number of important questions regarding the personal and economic costs that may be associated with higher rates of nursing home use. The personal and economic costs of nursing home use among the rural elderly may be considerable. Although there is considerable debate about the cost-effectiveness of home care services, it is unlikely that the cost of such services for persons with short-term rehabilitation needs, like those receiving rehabilitation services following hip fracture surgery, exceed that of a long nursing home stay. The personal costs for those nursing home residents who would prefer to be living in their own homes or in other independent settings may also be considerable.

The findings of this study suggest that there continues to be a need to understand why rural residents face a substantially higher risk of longer nursing home

stays. In a recent paper on the role of the nursing home in the rural long term care system, Shaughnessy (1994) suggests that rural elders may be “overinstitutionalized” in intermediate, custodial care facilities. This is consistent with research indicating that rural nursing facilities tend to more oriented toward longer-term chronic care patients than urban facilities and may, therefore, not be as attuned to residents’ rehabilitative needs.

Federal and state policy efforts such as new, more restrictive nursing home eligibility criteria and case mix based payment systems, may shift nursing home care toward greater emphasis on rehabilitative versus custodial care. At the same time, states are encouraging the development of alternative, non-medical residential care. Whether these new initiatives are successful in encouraging appropriate and early discharge of residents remains to be seen.

The ability of rural nursing facilities to discharge residents in a timely manner depends on a number of critical factors beyond the general orientation of nursing home administrators and staff, including the availability of residential alternatives, in-home services, and/or family members to provide transitional and supportive services. The availability of an appropriate and well-organized array of residential and supportive, in home services remains a critical problem in many rural areas. Data on the availability of institutional, in-home health and supportive services suggests that many rural communities have been left out of the gradual transformation that has occurred from a long term care system dominated by nursing homes to one emphasizing the need for a

range of medical and non-medical residential and in-home service options (Coward, Netzer and Peek 1996).

Although this and other studies demonstrate the greater nursing use among the rural elderly, research to date has been unsuccessful in identifying the factors contributing to higher nursing home use rates in rural populations and areas. There continues to be a need for a better understanding of the role that service supply and accessibility play in the patterns and outcomes of rural long term care.

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ENDNOTES

1. Data on hospital discharge destination contained in the Hospital Uniform Discharge Data Set were found to be unreliable. The distribution of patients by discharge setting as listed in this report is adjusted to reflect actual nursing home use as defined in the Maine Nursing Home Resident Assessment Files.
2. In the absence of a common person-level identifier within the hospital and nursing home records, it was necessary to first match hospital discharge and nursing home MDS + records. Record matching was achieved through an iterative, weighted comparison of each hospital record with the entire body of MDS + records using an algorithm which included a series of criteria developed to establish record matches. For each matching criterion in the algorithm, two probabilities were assigned for use as weights to reflect the likelihood of record match accuracy. The first weight reflected the probability of a match occurrence being exact, and the second reflected the probability of the match occurring randomly. Probabilities of match accuracy on each of the criteria in the algorithm were then summed to create a weighted probability for each pair of records compared. The weighted probability for each pair was then used to assign the pair to one of three weight range categories. Pairs with a weighted probability of matching at or above pre-defined weight cut-offs were defined as a match, records between the cut-off for matches and non-matches were flagged for clerical review and categorization, and pairs with a weighted probability below the cutoff for non-matches were assigned to the residual category. Following two iterations of the matching algorithm using the assigned probability weights for matching criteria, data from matches achieved in the first two iterations were used to calculate new probabilities of exact and random matches. The calculated weights were used in subsequent iterations of the matching process using a revised, and somewhat less restrictive algorithm. Additional information concerning this methodology is available from the authors upon request.
3. For purposes of the analyses reported here, residents with matched records who had received nursing home services prior to hospitalization of hip fracture were excluded from the analyses (n=434, or 42.5% of all older hospital patients discharged to nursing homes following initial hip surgery)
4. Univariate and bivariate analyses of discharge status during the first 6 months of nursing home care (discharged to home, due to death, to other facility, etc.) and length of stay in the nursing facility following hip surgery (not displayed here) suggested a non-linear pattern of length of stay among those discharged. Specifically, the mean and median lengths of stay for persons discharged to lower care settings during the

first 6 months following admission were 26 and 36 days respectively. These findings, recognition of Medicare limitations on payment for nursing facility care for such care, and previous findings which report that the average length of stay in a skilled nursing facility for care post-hip fracture is less than one month, lead to the decision to model discharge rates for two distinct time periods. On clarification of these issues it became evident that failure to test for effects at different intervals would have required adoption of untenable assumptions about resident characteristics and the impact of stage of convalescence on the effects of area service supply factors and their influence on discharge.

5. From a telephone survey of all licensed physical therapists in Maine it was learned that no independent physical therapists provide in-home services to persons with hip fracture. Based on this information, initial analyses were conducted using a simple count of home health agencies who reported serving each town. Further refinement of the in-home physical therapy measure, using home health cost report data on PT FTEs came at the suggestion of our ORHP Project Officer, Pat Taylor. While seemingly a minor adjustment, the improved measure has significantly improved our understanding of the dynamic of central interest to our research, the impact on nursing home outcomes attributable to differential access to in-home PT support in rural communities.



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