Risk Factors for Physical Restraint Use in Nursing Homes:

The Impact of the Nursing Home Reform Act

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This study examined the impact of the Nursing Home Reform Act of 1987 on resident-and-facility-level risk factors for physical restraint use in nursing homes. Data on the 1990 and 1993 cohorts were obtained from 268 facilities in 10 states, and data on a 1996 cohort were obtained from the Medical Expenditure Panel Survey, which sampled more than 800 nursing homes nationwide. Multivariate logistic regression models were generated for each cohort to identify the impact of resident- and facility-level risk factors for restraint use. The results indicate that the use of physical restraints continues to decline. Thirty-six percent of the 1990 cohort, 26 percent of the 1993 cohort, and 17 percent of the 1996 cohort were physically restrained. Although there was a reduced rate of restraint use from 1990 to 1996, similar resident-level factors but different facility-level factors were associated with restraint use at different points in time.

During the past decade, the Nursing Home Reform Act (NHRA) of 1987, included as part of the Omnibus Budget Reconciliation Act of 1987, has influenced several areas of nursing home care (Snowden and Roy-Byrne 1998). The law put in place several procedures such as preadmission screening and annual resident review to better serve nursing home residents. Among the changes targeted in the NHRA were strict controls governing the use of physical restraints (Omnibus

Budget Reconciliation Act 1987). This is important because physical restraints are associated with an increased risk of falls, nosocomial infections, and cognitive decline as well as mortality in nursing home residents (Castle and Mor 1998; Phillips, Hawes, and Fries 1993; Tinetti et al. 1991). This study attempts to examine the impact of the NHRA on patterns of physical restraint use a decade after the implementation of the reform in October 1991.

Before the implementation of the NHRA, the prevalence of the use of restraints in some facilities was as high as 85 percent (Evans and Strumpf 1989). A recent review of the literature found that the prevalence of restraint use has decreased from an estimated national average of 41 percent in 1990 to about 20 percent in 1994 (Guttman, Altman, and Karlan 1999). Although these findings indicate a reduction in the use of physical restraints following implementation of the law, they are based not on pre- and post-NHRA research studies but on state survey self-reports using various definitions of restraint use at various times of measurement. Snowden and Roy-Byrne (1998) noted there is "no single study that compared pre- and post-OBRA [Omnibus Budget Reconciliation Act] data on the use of restraints" (p. 230).

Castle, Fogel, and Mor (1997) conducted one of the few studies that employed the same measure of physical restraint use prior to and after the implementation of the NHRA. Using a sample drawn from 268 facilities in 10 states, they found both stability and change from 1990 to 1993. On one hand, they found a change in the prevalence of physical restraint use: a 30 percent reduction was observed after the NHRA was implemented. On the other hand, several factors that predicted restraint use remained the same over time; that is, activities of daily living (ADL) impairments and cognitive impairments predicted use of physical restraints both before and after the implementation. Castle and his colleagues also investigated the impact of facility factors, such as staffing ratios, ownership, and size of the nursing home on the use of restraints. They found that facilities with high nurse to resident ratios and those with high average occupancy were less likely to use restraints. Facilities with a high nurse aide to resident ratio and with a modest degree of competition from other facilities were more likely to use restraints.

This study extends the work of Castle et al. (1997) to provide further evaluation of the effects of the NHRA on restraint use over time. Using the same methodological procedures as this previous study, we

assessed the impact of resident and facility characteristics on rates of physical restraint use. More specifically, the purposes of the present study were to use 1996 data to (1) extend Castle et al.'s earlier findings on the impact of the NHRA and (2) identify resident- and facility-level factors that are associated with the use of physical restraints.

Method

DATA SETS

This study examined the data used by Castle et al. (1997) and the nursing home component of the Medical Expenditure Panel Survey (MEPS). Both of these data sets contained variables from the minimum data set (MDS). The MDS is a standard set of questions used to assess the nursing home resident's physical and mental status and is mandated by law to be used for anyone entering a federally assisted nursing home (Morris et al. 1990). Although there are multiple versions of the MDS (Hawes et al. 1997), the versions used in these two data sets were essentially the same. In both cases, MDS assessments were completed via resident interviews, staff interviews, and review of records.

The MDS data appear to be carefully constructed and are generally reliable. For example, based on 466 residents from selected homes, dual clinical assessor reliability trials resulted in an average Spearman-Brown reliability coefficient of .76 for the MDS items, including an average of .86 for the ADL items and .77 for the psychosocial well-being items (Hawes et al. 1995). In addition, data elements measuring cognitive status and physical functioning are highly correlated with equivalent items from research instruments (Morris et al. 1994).

The data used by Castle et al. (1997) came from three sources: the Centers for Medicare and Medicaid Services evaluation of the impact of implementing the congressionally mandated Resident Assessment Instrument; the On-line Survey, Certification, and Reporting System; and the Area Resource File. A comprehensive description of the former data was provided by Phillips et al. (1996); likewise, Castle (2000) provided descriptions of the On-line Survey, Certification, and Reporting and Area Resource File data.

Briefly, the Centers for Medicare and Medicaid Services evaluation of the impact of implementing the Resident Assessment Instrument, used in the Castle et al. (1997) study, was conducted in 1990 and 1993 in 10 states. The states were selected for variation in geographic location (Department of Health and Human Services region), Medicaid reimbursement rate (high or low), and average staffing patterns in the state's facilities (high or low number of residents per registered nurse). The 10 states selected were California, Connecticut, Iowa, Maryland, Maine, Ohio, Oregon, Tennessee, Texas, and Virginia. In each state, one metropolitan statistical area and its adjacent rural counties were selected. The sampling frame included all Medicaid-certified nursing homes that had at least 25 beds, were not owned by a governmental body, and were not certified as intermediate care facilities for the mentally retarded. A total of 268 facilities participated in the evaluation. In each facility, depending on the facility size, fixed target sample sizes of 8, 12, or 16 residents were selected. The same protocol was used in 1990 and 1993, and data were collected from a total of 2,170 residents in 1990 and 2,088 residents in 1993.

We used the MEPS because it represents one of the few data sources that is nationally representative and contains both resident and facility characteristics. MEPS surveys resident characteristics, use of health care, expenditures of nursing home residents, and the facility characteristics of nursing homes obtained by in-person interviewing using Computer Assisted Personal Interview technology. The MEPS nursing home component sampled more than 5,000 nursing home residents in 800 nursing homes to produce national estimates for persons residing in nursing homes during 1996 (Bethel, Broene, and Sommers 1998). The nursing homes included in the sample had at least three beds, were either certified by Medicare or Medicaid or licensed by a government agency as a nursing home, and provided 24-hour skilled nursing care. More detailed information regarding the methodology for the MEPS is provided elsewhere (Potter 1998).

For the current analysis, we used the complete national MEPS data set because insufficient information is provided with these data to permit identification of individual states. Thus, we were unable to select the 10 states sampled in the original Castle et al. (1997) study. The data used by Castle et al. were statistically representative of the nation as a whole, but we cannot discount that variation in findings between these

data and the MEPS data may be due to differences in geography—not just time frames.

VARIABLES

Following the guidelines developed by Castle et al. (1997), a total of 9 resident-level and 11 facility-level variables were generated using items from the MEPS Nursing Home Component. This selection of variables reflected the combined impact of resident, staff, and facility characteristics in restraint use (a fuller rationale for selection of these variables is provided in Castle et al. 1997). Brief definitions of these variables are reported in Table 1. We included only variables for which we had data available from all three cohorts.

The dependent variable in this study is the use of physical restraints. According to the Centers for Medicare and Medicaid Services's guidelines, "physical restraint use" is defined at 42 CFR Section 483.13 (a) under Interpretive Guidance in the *State Operations Manual* as "any manual method or physical or mechanical device, material, or equipment attached or adjacent to the individual's body that the individual cannot remove easily which restricts freedom of movement or normal access to one's body" (Health Care Financing Administration 1992).

Use of physical restraints was operationalized by self-report survey items that assess how often trunk restraint, limb restraint, and/or chair restraint was used. Because only self-report data were obtained, it is likely that the rates of restraint use reported underrepresent actual rates of restraint use. Following the convention of previous research (Castle et al. 1997; Castle in press; Evans et al. 1997; Phillips et al. 2000), the use of bed rails was not included in the measure of restraint use. These variables were originally counted separately in the MDS but were recoded for our analyses to create a dichotomous category of "any use of restraints" versus "no use of restraints." Thus, restraint use represents an incidence of being physically restrained in a nursing home with the use of trunk, limb, and/or chair restraint.

ANALYSES

The individual resident was the unit of analysis of this study. A multivariate logistic regression model was generated for each cohort

TABLE 1
Operational Definitions of the Study Variables
for the Medical Expenditure Panel Survey 1996 Cohort

Variable	Operational Definition
Resident-level variables	
Activities of daily living	Based on six items—transfer, locomotion on unit, dressing, eating, toilet use, and bathing—scored from 0 to 5, with higher values indicating greater impairment
Cognitive Performance Scale	Seven-category minimum data set Cognitive Performance Scale[a] scored from 0 to 6, with higher values indicating greater cognitive impairment
Age	Standardized age in years as of January 1, 1996
Gender	Male (1)[b] or female (0)
Race	White (1)[b] or other (0)
Incontinent bladder/bowel	Residents classified as incontinent (1)[b] or not (0) in the past 14 days
Mobility problems	Based on use of cane/walker and/or wheelchair
Facility-level variables	
Staffing ratios	a. Full-time-equivalent registered nurses per bed
	b. Full-time-equivalent licensed practical nurses per bed
	c. Full-time-equivalent nurse aids per bed
Ownership	Facility is for profit (1)[b] or is not for profit (0)
Hospital based	Facility is owned by a hospital (1)[b] or is not owned by a hospital (0)
Medicaid census	Medicaid-certified beds per total number of beds
Occupancy rate	Number of residents per bed
Size	Number of beds
Chain	Facility is owned by a chain (1)[b] or is not owned by a chain (0)
Alzheimer's special care	Facility does have an Alzheimer's special care unit (1)[b] or does not have an Alzheimer's special care unit (0)
Other special care units	Facility does have other special care unit (1)[b] or does not have other special care unit (0)

a. See Morris et al. (1994) for further details.
b. Coding used for logistic regression.

to identify the impact of resident- and facility-level factors on restraint use. For the 1996 cohort, 9 individual variables were included as the resident-level factors, and 11 facility-level variables were included. The Software for Survey Data Analyses, specifically designed for examining multistage sample designs similar to the one used in MEPS, was used to analyze the MEPS data. This software sufficiently weights the cases and adjusts the standard errors to account for this sampling strategy (Shah, Barnwell, and Bieler 1997). Software for

Survey Data Analyses has been commonly used in health services research to analyze sample survey data.

Results

The first purpose of this study was to extend Castle et al.'s (1997) earlier findings on the impact of the NHRA by using the MEPS data. Restraint use is compared across three cohorts, representing nursing home populations at three times of measurement—1990 (prior to the implementation of the NHRA), 1993 (the first wave of measurement after the implementation), and 1996 (the second wave of measurement after the implementation). Table 2 presents descriptive statistics of the variables used in the study for all three cohorts. The results indicate that the use of physical restraints continues to decline. Thirty-six percent of the 1990 cohort, 26 percent of the 1993 cohort, and 17 percent of the 1996 cohort were physically restrained.

Table 2 also shows both similarities and differences in resident- and facility-level factors across the three cohorts. Resident-level factors that are similar across cohorts include the average scores of cognitive performance and age. Resident-level factors that are different across the three cohorts are the levels of bladder incontinence, bowel incontinence, mobility problems, racial groups, and gender. The facility-level factors that are similar for the three cohorts are bed size and average occupancy. The facility-level factors that showed differences across the three cohorts are ownership status, chain membership, percentage of Medicaid-certified beds, and percentage of hospital-based facilities.

The second question we addressed in this study was which resident- and facility-level factors are associated with the use of physical restraints. We used three logistic regression models to address this question, and Table 3 summarizes the adjusted odds ratio estimates for each model. Across cohorts, the same resident-level factors, with the exception of mobility problems, were significantly associated with restraint use. For the 1990 cohort, more physical (ADL) and cognitive impairment, having a history of falls, and having mobility problems significantly increased the likelihood of restraint use. For the 1996 cohort, more physical and cognitive impairment significantly

TABLE 2
Descriptive Statistics: Means or Percentages and Standard Deviations of
the Study Variables for the 1990, 1993, and 1996 Cohorts

	1990 Cohort[a]		1993 Cohort[b]		1996 Cohort[c]	
	M or %	SD	M or %	SD	M or %	SD
Resident-level variables						
Restrained	36%	—	26%	—	17%	—
Activities of daily living[d]	3.1	1.5	3.2	1.5	2.3	1.3
Cognitive Performance Scale[e]	2.9	2.1	3.1	2.0	2.9	2.0
Age	84	13	82	12	82	13
Female	76%	—	77%	—	71.5%	—
White	82%	—	83%	—	88.6%	—
Cancer	6%	—	6%	—	7.3%	—
Incontinent bladder[f]	21%	—	17%	—	32.9%	—
Incontinent bowel[g]	31%	—	28%	—	32.5%	—
Mobility problems	60%	—	66%	—	77%	—
Facility-level variables						
Full-time-equivalent registered nurses per resident	.06	.04	.04	.05	.07	.11
Full-time-equivalent licensed practical nurses per resident	.11	.24	.10	.26	.09	.09
Full-time-equivalent nurse aides per resident	.29	.11	.28	.12	.29	.14
Size	146	87	147	86	147	105
For profit	69%	—	69%	—	65%	—
Chain membership	48%	—	55%	—	55%	—
Average occupancy	88%	16	88%	14	88%	13
Average Medicaid occupancy	62%	25	64%	24	78%	19
Hospital based	3%	—	3%	—	7.5%	—
Alzheimer's special care units	12%	—	14%	—	19%	—
Other special care units	3%	—	4%	—	8%	—

SOURCE: Castle, Fogel, and Mor (1997) for columns 2 and 3.
NOTE: Dashes indicate nonsignificant results.
a. Analysis based on total weighted *N* of 61,653 residents.
b. Analysis based on total weighted *N* of 59,997 residents.
c. Analysis based on total weighted *N* of 1,563,858 residents.
d. 1990, 1993, and 1996 activities of daily living (ADL) scores are based on the same set of items, but 1990 and 1993 ADL items were scored from 0 to 6, while 1996 ADL items were scored from 0 to 5, with higher values indicating greater physical impairment.
e. Higher values indicate greater cognitive impairment.
f. Rates corrected from published (Castle et al. 1997) rates per instructions of the authors.
g. Rates corrected from published (Castle et al. 1997) rates per instructions of the authors.

increased the likelihood of restraint use. Being older, however, slightly but significantly decreased the likelihood of restraint use.

An examination of the influence of facility-level factors on restraint use revealed that there were no similarities across any of the cohorts

TABLE 3
Resident and Facility Factors Associated With Physical Restraint Use
in the 1990, 1993, and 1996 Cohorts: Results From
Multivariate Logistic Regression Analyses

	1990 Model [a]	1993 Model [b]	1996 Model [c]
Resident-level variables			
Activities of daily living[d]	2.13 (1.9-2.4)***	2.18 (1.9-2.5)***	1.11 (1.05-1.16)***
Cognitive Performance Scale[e]	1.31 (1.2-1.4)***	1.28 (1.2-1.4)***	1.40 (1.15-1.70)***
Age	—	1.10 (1.01-1.23)*	.99 (.98-.99)**
Gender (female vs. male)	—	—	—
Race (White vs. others)	—	—	—
Cancer	—	—	—
Incontinent bladder	—	—	—
Incontinent bowel	—	—	—
Antipsychotic medications	1.38 (1.01-1.9)*	1.48 (1.01-2.2)*	NA
History of falls	1.42 (1.1-1.9)*	1.46 (1.1-1.9)*	NA
Mobility problems	1.33 (1.2-1.4)***	1.21 (1.01-1.3)**	—
Facility-level variables			
Full-time-equivalent registered nurses per resident (terciles)[f]			
High	—	0.43 (0.2-0.9)**	—
Medium	—	—	—
Full-time-equivalent licensed practical nurses per resident (terciles)[f]			
High	—	—	—
Medium	—	—	—
Full-time-equivalent nurse aides per resident (terciles)[f]			
High	0.73 (.05-.097)*	1.44 (1.1-2.1)*	—
Medium	0.77 (0.5-0.96)*	1.22 (1.02-1.7)*	—
Size (terciles)[f]			
High	—	—	.68 (.57-.82)***
Medium	—	—	—
Medicaid census (terciles)[f]			
High	—	—	—
Medium	—	—	—
Average occupancy (terciles)[f]			
High	1.60 (1.2-2.1)**	0.49 (0.2-0.9)**	—
Medium	1.66 (1.1-2.5)*	—	—
Herfindahl index (terciles)[f]		NA	
High	—	1.40 (1.01-1.9)*	
Medium	—	0.61 (0.5-0.8)**	
Hospital owned	—	—	—
For-profit ownership	1.24 (1.01-1.8)*	—	—
Chain membership	—	—	—

(continued)

TABLE 3   Continued

	1990 Model [a]	1993 Model [b]	1996 Model [c]
Alzheimer's special care unit	—	0.60 (0.4-0.9)*	—
Other special care units	—	—	—
Medicaid reimbursement policy	—	1.64 (1.2-2.2)**	NA

SOURCE: Castle, Fogel, and Mor (1997) for columns 2 and 3.
NOTE: Only significant outcomes are reported. The upper and lower 95 percent confidence intervals for the odds ratios are given in parenthesis. Dashes indicate nonsignificant results. NA = not available.
a. Analysis based on total weighted N of 61,53 residents.
b. Analysis based on total weighted N of 58,997 residents.
c. Analysis based on total weighted N of 1,563,858 residents.
d. 1990, 1993, and 1996 activities of daily living (ADL) scores are based on the same set of items, but 1990 and 1993 ADL items were scored from 0 to 6 while 1996 ADL items were scored from 0 to 5, with higher values indicating greater physical impairment.
e. Higher values indicate greater cognitive impairment.
f. The comparison group is the low percentile.
*Statistically significant chi-square at the .05 level or better.
**Statistically significant chi-square at the .01 level or better.
***Statistically significant chi-square at the .001 level or better.

on any of the factors. For the 1990 cohort, while higher full-time-equivalent nurse to resident ratios decreased the likelihood of the use of restraints, higher full-time-equivalent nurse aides to resident ratios and higher occupancy rates appeared to increase the likelihood of the use of restraints. For the 1996 cohort, the only facility-level factor that was significantly associated with restraint use was the number of beds in a facility. Specifically, a high number of beds significantly decreased the likelihood of restraint use.

Discussion

The first purpose of this article was to extend the earlier work of Castle et al. (1997) on assessing the impact of the NHRA. We find that there has been a significant decrease in the rate of restraint use since the implementation of the NHRA: a reduction from 36 percent in 1990 to 17 percent in 1996. Our results also reflect the dynamics of nursing home care. There is a trend toward sicker residents across the three cohorts (as reflected in higher rates of mobility problems, bladder incontinence, bowel incontinence, and special care units). Thus,

restraint use patterns must be viewed within the context of a sicker population of older adults.

The second purpose of this article was to identify resident- and facility-level factors that contribute to the use of physical restraints in nursing homes. There are several conclusions that are noteworthy. Although there was a reduced rate of restraint use from 1990 to 1996, similar resident characteristics, but not facility characteristics, were associated with restraint use.

These results have some utility in that they may be used by providers and regulators for the development of specific programs to further decrease, if not eliminate, the rates of restraint use. Recent research has shown that educational initiatives in restraint use can help decrease their use in nursing homes (Cohen et al. 1996; Dunbar et al. 1996; Dunbar and Neufeld, 2000; Evans et al. 1997). Initiatives such as these could be used in facilities when residents have more physical (ADL) and cognitive impairment or when residents have a history of falls or other mobility problems.

Prior to the implementation of the NHRA, for-profit facilities were less likely to use restraints. However, this effect was not found with the 1996 data. Thus, the NHRA may have been successful in removing the systematic differences in restraint use between for-profit and not-for-profit facilities. However, the 1996 data show other systematic differences in facility characteristics in restraint use. Larger number of beds significantly decreased the likelihood of restraint use. The results of this analysis are important in that we still see many of the same resident risk factors for restraint use despite the implementation of the NHRA. The NHRA mandated that nursing homes reduce their use of physical restraints and that residents have the right to be free from any physical restraint imposed for purposes of discipline or convenience. Since the passage of this act, the standard of care has become that no restraints should be used, and many facilities have used workshops and manuals to help eradicate this practice. However, the results suggest that the increased attention to restraint use has not altered the types of residents who are restrained. As Castle et al. (1997) noted, the threshold level for restraint may have risen (to the point where no restraints is the standard), but the underlying rationale for restraint use may not have changed.

These results raise the larger issue of how to define success within the context of long-term care for chronically ill residents. The current

pattern of restraint use represents a 50 percent reduction compared to the benchmark before implementation of the NHRA. Yet the goal of restraint-free environments was the driving force for the restraint-reduction mandate included in the NHRA.

When the NHRA was passed, there was an assumption among legislators and regulators that additional regulatory reform would lead to improved quality of care in nursing homes. A decade later, it is appropriate to complement national data, such as the MEPS data, with smaller, qualitative studies that go beyond reporting the rates of restraint use to assessing the effectiveness of restraint-reduction programs as currently practiced. The present study allows an assessment of nationwide rates. Further assessment of impact and efficacy of restraint-reduction efforts will require longitudinal analyses following the care trajectories of specific impaired residents. In addition, further research is needed to examine the association of several factors found to be related to restraint use in nursing homes. For example, it seems that mobility problems increased after the reform, both in the general nursing home population and among restrained residents, but as the work of Capezuti et al. (1996) shows, the removal of physical restraint does not lead to an increase in falls or subsequent fall-related injuries in older nursing home residents.

Using the MEPS data to extend the earlier work of Castle and his colleagues (1997) has both advantages and limitations. The MEPS data were designed to provide national estimates of nursing home use and resident functioning. In contrast, Castle et al. relied on data from a sample of the homes in the same 10 states in both 1990 and 1993. Thus, variation in findings across the three cohorts may be due to the different geographic frames. Because the samples are different, it is possible that the differences we observe across the samples are due to sampling effects.

In addition, the MEPS data set did not include all of the items used in Castle et al.'s (1997) earlier work. Specifically, several factors found by Castle et al. to be significant risk factors for restraint use were not included in the MEPS data: the resident's history of falls, the Herfindahl index (a measure of economic competition), and Medicaid reimbursement information. Again, this makes complete comparisons across the three times of measurement impossible. The MEPS data set also does not include a variable identifying the state. As described above, we were therefore unable to use the 10 states sampled in the

original Castle et al. study. Also, some states introduced case-mix reimbursement systems during the time period of our investigation. As such, some of the differences we observed may be due to "upcoding," which sometimes occurs when such systems are introduced. Because we cannot identify individual states, we are unable to provide analyses to help identify the magnitude of such effects.

As with most retrospective analyses using data collected at numerous points in time, we cannot control for all factors that may have influenced the reduction in physical restraint use. We believe that the NHRA has influenced the patterns of physical restraint use, but other factors are likely to have acted simultaneously. These factors include newspaper exposés, changes in case law, and research publications, to name just a few (Castle and Mor 1998).

Restraints cannot be indiscriminately removed in the absence of assessments and appropriate interventions to meet residents' needs. Thus, to ensure safety and facility compliance with regulatory mandates, restraint-reduction efforts must be implemented. This analysis indicates that some types of facilities are more likely than others to reduce restraints. Future restraint policy initiatives should be sensitive to this differentiation of nursing home characteristics in making the requisite changes.

This study allowed an assessment of factors associated with restraint use at three points in time. Within the constraints of sample and measurement limitations, we have documented considerable reduction in physical restraint use and continuing combined influence of individual- and facility-level factors in predicting restraint use. Regulatory reform may be a limited instrument for changing long-term care quality. It appears, however, to have contributed to a considerable reduction in, but not elimination of, physical restraint use in nursing home residents.

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