



Safe Lifting Programs at Long-Term Care Facilities and Their Impact on Workers Compensation Costs

Introduction

The aging US population contributes in a variety of ways to workers compensation costs. For one, the workers compensation costs associated with an older workforce differ in structure and magnitude from those of a younger workforce—NCCI has analyzed these cost implications in earlier studies.¹ An aging population also increases employment in industries and occupations that provide services to the elderly. A prominent example is the growth in long-term care facilities.

Previous research by NCCI has indicated that long-term care facilities have injury rates that are materially greater than average, and that back injuries are a major contributor to workers compensation claims.² To a large degree, these injuries are incurred by workers while lifting and moving patients. This exposure is likely to increase as this industry expands. Additional NCCI research has identified the increased use of productivity-enhancing processes as a major source of improved workplace safety.³ The use of powered mechanical lifts in long-term care facilities supports these earlier studies regarding the importance of process innovation on workplace injuries.

This study is a collaborative effort with researchers at the University of Maryland School of Medicine. The objective of this research was to assess the implications for workers compensation costs of safe lifting programs in long-term care facilities. The original intent was to compare facilities with and without safe lift programs, but the survey results indicate that by the end of the survey period, close to 95% of facilities had powered mechanical lifts and close to 80% routinely used them. Therefore, the focus shifted from whether or not facilities had safe lift programs to the implementation of the program.

Accordingly, we chose to limit this analysis to facilities with safe lift programs in place for more than three years and include other aspects of the design and implementation of the safe lift program.⁴ To this end, Directors of Nursing (DONs) at long-term care facilities were surveyed to determine the status of their safe lift programs. The survey information for each facility was then linked to NCCI data on facility injuries and workers compensation costs. In this way, it was possible to test the association between workers compensation costs and safe lift programs.

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¹ *Age as a Driver of Frequency and Severity*, December 2006, and *Claims Characteristics of Workers Aged 65 and Older*, January 2010, ncci.com.

² *An Emerging Issue for Workers Compensation—Aging Baby Boomers and a Growing Long-Term Care Industry*, Fall 2007, ncci.com.

³ *The Mystery of the Disappearing Frequency—So Important, So Misunderstood*, presented at NCCI's *Annual Issues Symposium*, May 11, 2006.

⁴ This is an extension of a finding in the working paper, *Do Assistive Devices and Training Affect Injury Incidence? Prevention Efforts by Nursing Homes and Back Injuries of Nursing Assistants* by D'Arcy, Stearns, and Sasai. (November 11, 2008) that training is a key determinant in reducing injury rates.

Approach and Key Findings

The statistical modeling performed for this study attempts to capture the impact on workers compensation claims experience of (1) the presence of powered mechanical lifts (PMLs) at long-term care facilities and (2) the degree of emphasis placed on the actual implementation of such a program. To this end, an index was developed that comprises in a single number the many aspects of a safe lift program. This safe lift index encompasses information on the policies, training, preferences, barriers, and enforcement surrounding the use of powered mechanical lifts. The statistical findings indicate that higher values of the safe lift index are associated with lower values for both frequency and total costs of claims related to injuries that have been sustained due to lifting.⁵

The statistical analysis also establishes a role for the type of ownership structure of the long-term care facility. There are three ownership types: for-profit, not-for-profit private, and government. The findings show that for-profit facilities have lower claim frequency and lower total claim costs than not-for-profits.⁶

Statewide frequency was included in the models to control for differences in workers compensation systems across states. Facilities in states with higher statewide frequency tend to have both higher frequency and higher total costs.

Issue

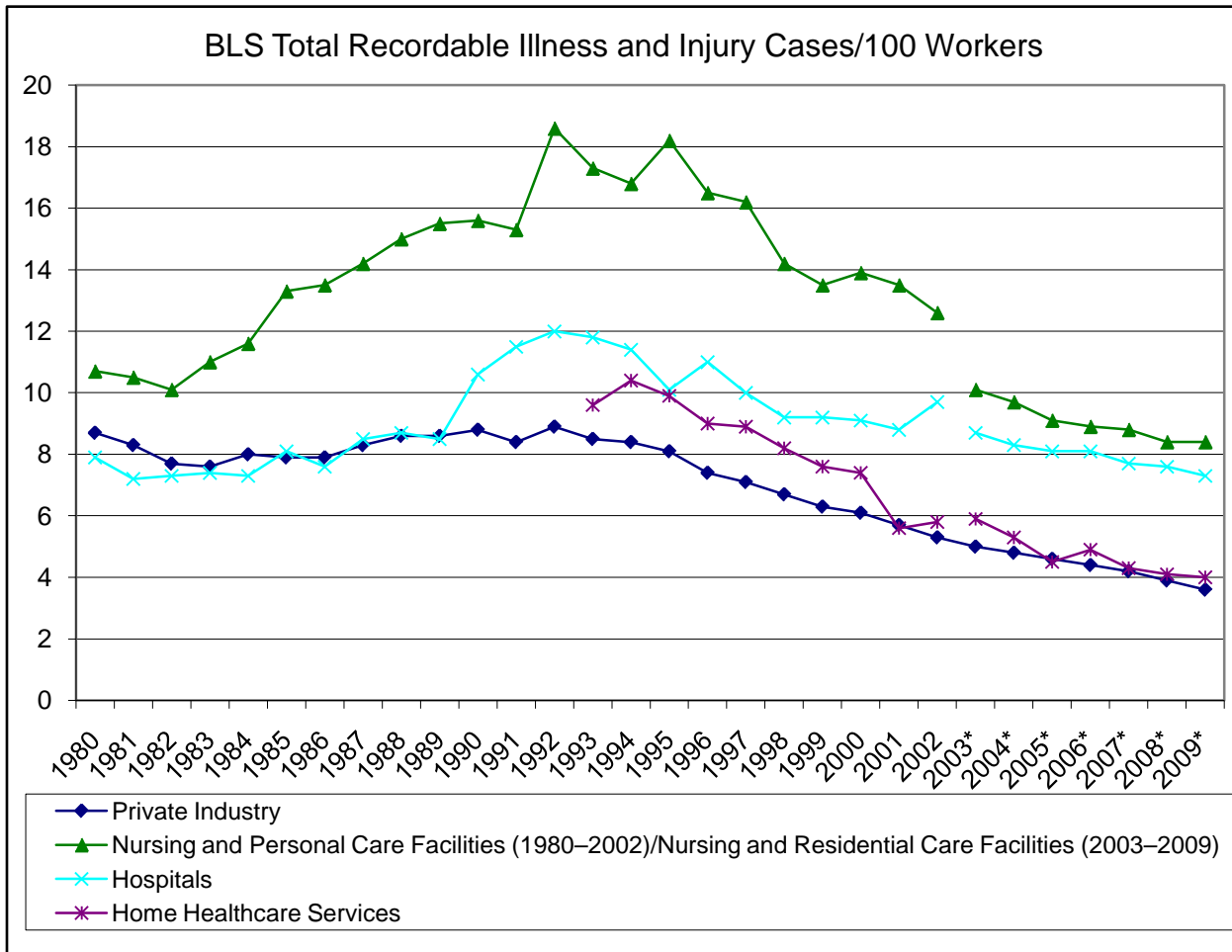
Data from the US Department of Labor's Bureau of Labor Statistics (BLS) illustrates that injury rates at long-term care facilities are higher than those for All Private Industries and for other healthcare fields. Compared to the private industry with a rate of 3.6 injuries per 100 full-time employees (FTE) in 2009, long-term care facilities report an injury rate more than twice that at 8.4 per 100 FTE. The incidence rate for long-term care facilities is also higher than that reported in other health fields (see Exhibit 1).⁷

⁵ From a technical perspective, both frequency and total costs of claims are measured relative to exposure.

⁶ There were too few government-operated facilities to support strong conclusions, but in general, they did not seem to be statistically different from the not-for-profits.

⁷ In Exhibit 1, the series labeled "Nursing and Personal Care Facilities (1980–2002)/Nursing and Residential Care Facilities (2003–2009)" captures the long-term care sector, but the definitions used by the government changed in 2003 with the change from the Standard Industrial Classification (SIC) to the North American Industrial Classification System (NAICS). For a technical description, see www.bls.gov/bls/naics.htm.

Exhibit 1*



* The gap between 2002 and 2003 reflects a change in industry classifications and indicates that data for 2003 to 2009 is not completely comparable to previous years.

Caring for patients in long-term care facilities often involves manual lifting, transferring (for example, from bed to chair), and repositioning of residents in bed. One study estimated that during an average day shift of eight hours, a nursing assistant performs more than 20 lifts or transfers of residents.⁸ Another study showed that the manual lifting and repositioning of patients and frail elderly residents frequently exceeds the lifting capacity of most caregivers.⁹ Factors that contribute to the hazard of lifting or transferring residents included the size and weight of the resident, the ability of the resident to bear some of their weight, and the resident's cognitive ability to cooperate with the caregiver.¹⁰

⁸ Garg A, Owen BD, Carlson B., An ergonomic evaluation of nursing assistants' job in a nursing home. *Ergonomics*, 35(9): 979-95. September 1992.

⁹ Marras WS, Davis KG, Kirlering BC, and Bertshe PK. A Comprehensive Analysis of Low-Back Disorder Risk and Spinal Loading During the Transferring and Repositioning of Patients Using Different Techniques. *Ergonomics*, Vol. 45. No. 7. 904–926. 1999.

¹⁰ Collins JW, Nelson A, and Sublet V. *Safe Lifting and Movement of Nursing Home Residents*. CDC/NIOSH. DHHS (NIOSH) Publication No. 117. 2006. Available online at www.cdc.gov/niosh/docs/2006-117/.

The goal of this study is to estimate the benefits in terms of reduced workers compensation claim costs that are associated with the implementation of safe lift programs in long-term care facilities. In particular, facilities can implement the use of powered mechanical lifts instead of lifting and transferring patients manually. Types of powered mechanical lifts include full lifts that are either free standing or overhead and sit-stand lifts as seen in Exhibit 2. However, just purchasing and having the lifts available is not enough to ensure that they are used and used correctly; therefore, the survey conducted as part of this study also included questions to measure intangibles, such as training programs and attitudes toward using the mechanical lift equipment.

Exhibit 2
Examples of Powered Mechanical Lifts



Full Lift (Free Standing)



Sit-Stand Lift



Full Lift (Overhead)

Data

Survey Data

The survey data was collected by researchers at the University of Maryland School of Medicine and included online, telephone, and mail responses of the DONs at long-term care facilities. DONs at a total of 265 facilities completed the survey sometime during the period November 5, 2007 through May 12, 2008. The survey time interval is of significance because while some variables are measured repeatedly (observed on an annual basis in 2005, 2006, and 2007), others are measured only once (at the time of the response to the survey, which is late 2007 or early 2008). The closest match to the survey observations are the annually observed data points for the year 2007.

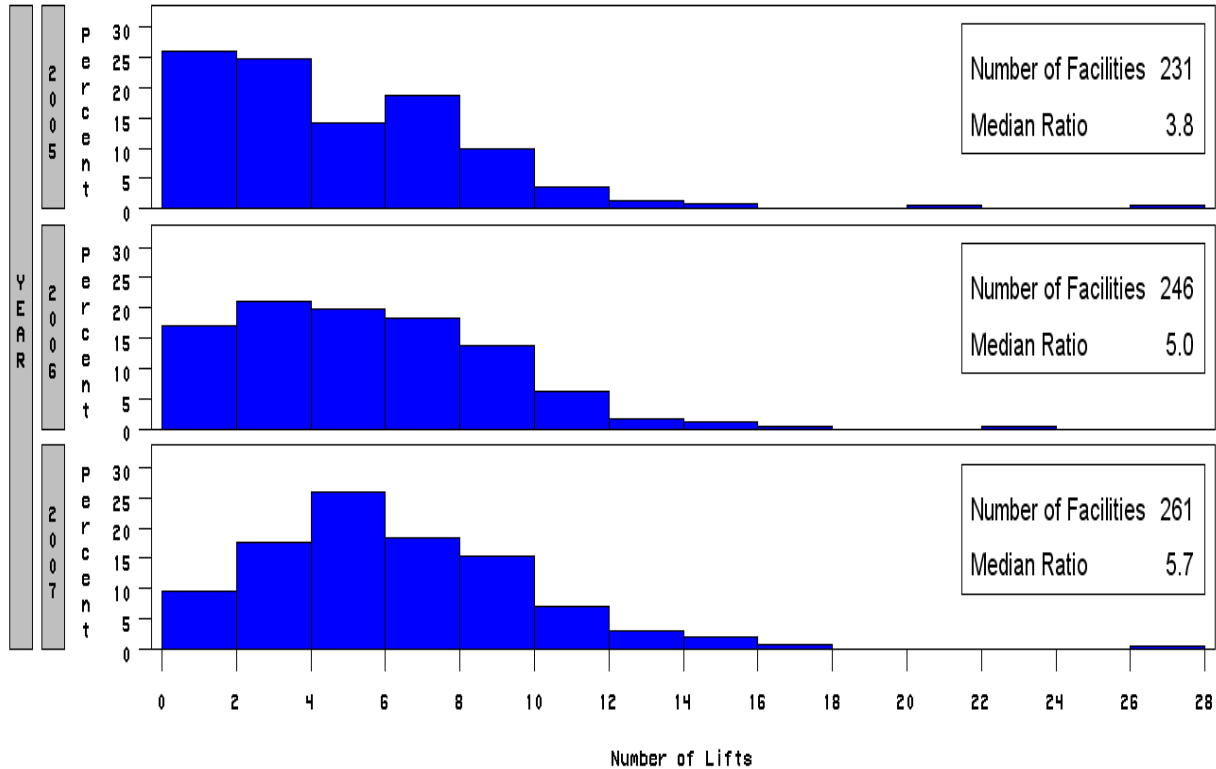
Evidence of Increasing Availability of Mechanical Lifts

Observations available on an annual basis (for 2005, 2006, and 2007) include the number of residents of the long-term care facility and the number of powered mechanical lifts (full free standing, sit-stand, full overhead). From these observations, the ratio of total lifts to 100 residents can be constructed for each year. The histograms in Exhibit 3 indicate that there was a modest increase in the relative number of safe lift machines over this period, as the distribution of the lifts per 100 residents gradually shifted to the right from 2005 to 2007. For instance, the share of facilities with only a limited number or no mechanical lifts fell markedly from 2005 to 2007. In 2005, 26% of facilities had no more than two lifts per 100 residents (i.e., a ratio between 0 and 2)—this share fell to 17% in 2006 and to 10% in 2007. The median ratios increased from 3.8 lifts per 100 residents in 2005 to 5.0 in 2006 and 5.7 in 2007.

Exhibit 3

The Number of Lifts per 100 Residents Increased Over the Study Period

for all facilities surveyed



Lifts Relative to Residents Requiring Assistance

The data in Exhibit 3 measures lifts to all residents whether they need assistance or not. Another variable of interest is the ratio of lifts to residents who need lifts. The National Institute of Occupational Safety and Health (NIOSH) estimates that the ideal number is approximately one full lift for every eight to ten non-weight-bearing residents (0.100–0.125) and approximately one sit-stand lift for every eight to ten partially weight-bearing residents (0.100–0.125).¹¹ The survey data for residents needing a lift is only available for the time of the surveys—as mentioned, survey data is best matched with observations for Calendar Year 2007. Exhibit 4 displays data for the share of facilities in each category (no powered lifts, below NIOSH standards, meet NIOSH standards, and above NIOSH standards) based on the number of full lifts in 2007 relative to the number of residents needing full lifts at the time of the survey, and the number of sit-stand lifts in 2007 relative to the number of residents needing sit-stand lifts at the time of the survey. The graph shows that most facilities in the survey had ratios that exceeded the NIOSH standards of 0.125.¹²

¹¹ Collins JW, Nelson A, and Sublet V. *Safe Lifting and Movement of Nursing Home Residents*. CDC/NIOSH. DHHS (NIOSH) Publication No. 117. 2006. Available online at www.cdc.gov/niosh/docs/2006-117/.

¹² Exhibits 4 and 5 exclude facilities without ratio information and facilities with ratios of 100% or more.

Exhibit 4

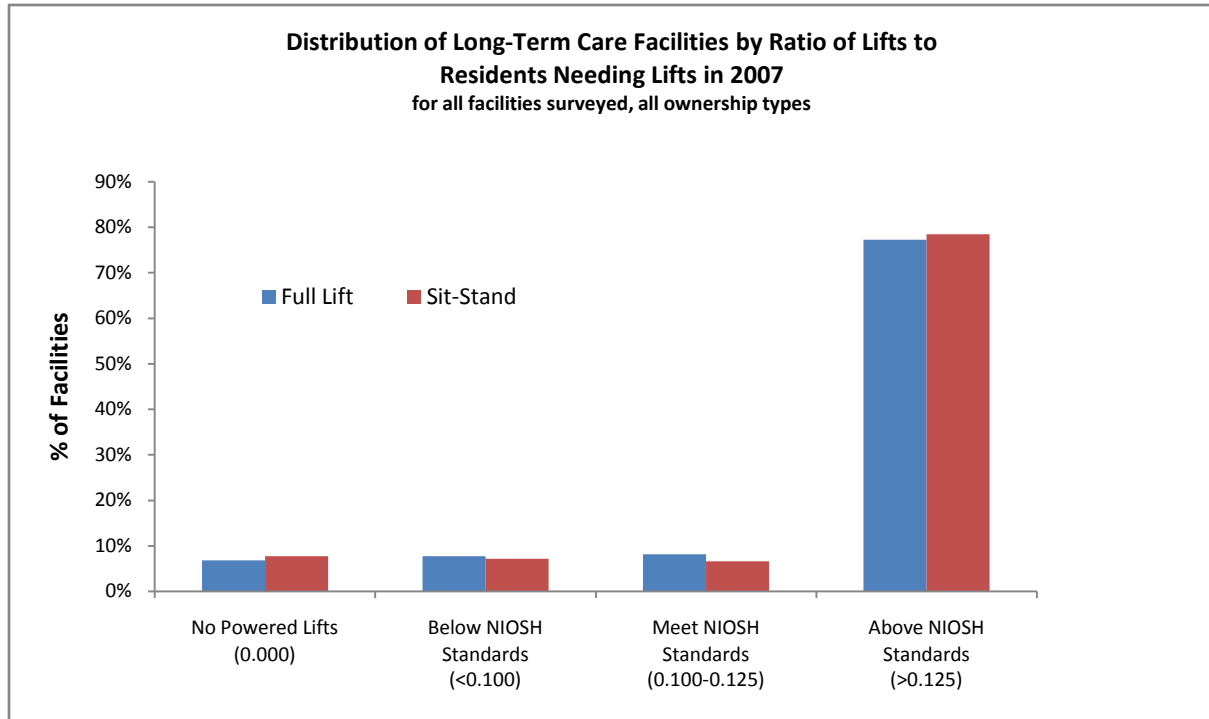
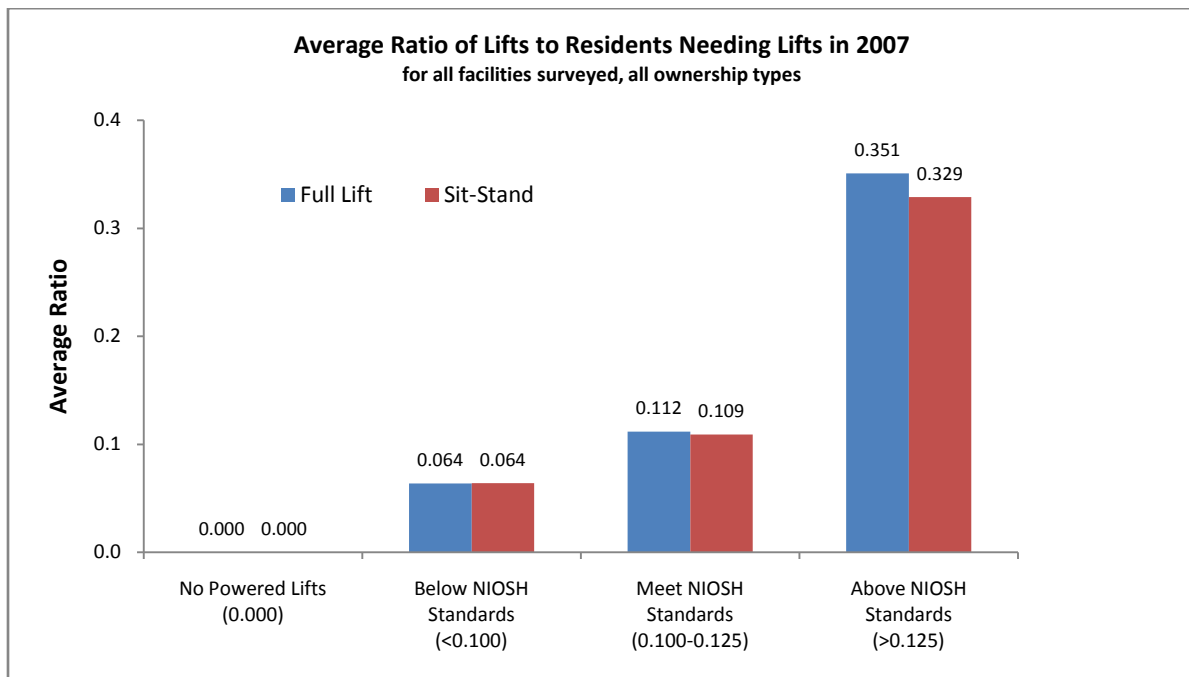


Exhibit 5 shows that the average ratio for the facilities exceeding the NIOSH standards was 0.351 for full lifts and 0.329 for sit-stand lifts or approximately one lift to every three residents needing lifts. While not shown in these exhibits, results were comparable across the three ownership structures.

Exhibit 5



Other Surveyed Features of Safe Lift Programs

Other survey variables that can be used to characterize individual safe lift programs at the time of the survey reflect the following:

- Policies and procedures
- Caregiver training
- Resident lift-assist identification
- Use of powered mechanical lifts
- Safety and injury reporting procedures
- Staff retention and turnover
- Attitudes about lifts
- Barriers to using lifts
- Certified nursing assistant injury and turnover

Appendix A contains examples of the specific questions asked in each of the above categories.

Creating the Safe Lift Index

The use of an index is a common and typically necessary approach when working with a large number of highly correlated potential explanatory variables. Once the surveys were complete, researchers at the University of Maryland constructed a safe lift index for the purpose of aggregating answers from the survey questions into a single number. Factor analysis was used to select a limited set of variables that best predicted safe lifting practices. These survey variables pertained to policies and procedures regarding powered mechanical lifts, training of certified nursing assistants (CNA) in the use of powered mechanical lifts, preferences of the Director of Nursing (DON) for powered mechanical lift use, potential barriers to the use of powered mechanical lifts, and enforcement of the lift policies. Exhibit 6 itemizes the specific variables that entered the safe lift index. There are 11 variables that go into the creation of the index: four reflect the institution's policies and procedures having to do with the safe lifts; three reflect the preferences of the director of nursing; three reflect barriers related to physical facility impediments and resident attitudes; and one measures lift policy enforcement. See Appendix B for a detailed description of the methodology that was employed for the construction of the safe lift index.

Exhibit 6

Survey Questions Underlying Variables Included in the Safe Lift Index

<p>1. Policies and Procedures</p> <ul style="list-style-type: none"> • For residents not able to move around on their own, do procedures require powered mechanical lift use? • For residents not able to move around on their own, do their care plans require the use of powered mechanical lifts? • When a CNA's job performance is being evaluated, how often is the use of powered mechanical lifts mentioned? • Are newly hired CNAs trained in how to use powered mechanical lifts?
<p>2. Director of Nursing (DON) Preferences</p> <ul style="list-style-type: none"> • May two caregivers lift a resident manually? • DON preference for use of powered mechanical lifts to move from bed to chair (or vice versa) for residents weighing 150 pounds • DON preference for use of powered mechanical lifts to move from bed to chair (or vice versa) for residents weighing 90 pounds
<p>3. Barriers</p> <ul style="list-style-type: none"> • DON perception of barriers: difficult to use in the residents' bathrooms • DON perception of barriers: resident concern about falling during a lift • DON perception of barriers: maintenance/battery/sling problems
<p>4. Enforcement</p> <ul style="list-style-type: none"> • Stringency of lift policy enforcement: if the policy is violated, is the employee fired, suspended but not fired, warned but not suspended or fired, or retrained only?

Data on Workers Compensation Claim Experience at the Surveyed Facilities

Survey data for each facility was matched with NCCI policy and claims data. Therefore, the study is limited to facilities where NCCI could directly match the survey responses to the workers compensation data. For the most part, this primarily limited the facilities to ones with a single location. However, some multilocation facilities were included where the data could be isolated for the specific facility that answered the survey. Available policy data include the policy effective date, class code, exposure, and premium. Available claims data include accident date, class code, paid and incurred indemnity and medical loss dollars, report number, part of body, cause of injury, and nature of injury.

Two outcome variables were derived from NCCI data—one for frequency and one for total costs. In both cases, calendar/accident year data at an annual rate were constructed from the policy period data—this is to better match the timing of the observations with the calendar year survey data. The focus is on injuries due to lifting in nursing-related class codes, which limits the data to eight specific class codes¹³ and the cause of injury code to lifting (injury code 56). Variables for 2005, 2006, and 2007 were constructed using data at first report.¹⁴

The frequency variable is defined as all claims (medical only and lost time) per full-time equivalent worker, at an annual rate. The number of full-time equivalent workers of a long-term care facility is the ratio of the payroll of the facility to the respective average annual wage of nursing care facilities in the state in which the facility operates.¹⁵

As mentioned, calendar/accident year frequency at an annual rate was constructed from policy period data such that it was consistent with the calendar year survey data. To achieve this consistency, exposure was adjusted to a calendar year basis by assuming the number of full-time equivalent workers is constant for the time period, and then claims were counted by accident date. In cases where continuous policies were unavailable, numerator and denominator still covered the same time period, although this time period was now shorter than one year.¹⁶

The total cost variable was constructed in a similar fashion but is defined as total medical and indemnity paid losses,¹⁷ divided by exposure. Again, exposure was adjusted to a calendar year basis and the numerator and denominator were consistent in terms of the months included.

Other variables used in the analysis included data on the ownership structure (for-profit, not-for-profit, government) for each facility; this information was available from the Center for Medicare and Medicaid Services. Most facilities that responded to the survey are for-profit (165), followed by not-for-profit (78) and government (22). Statewide frequency data from NCCI was used to control for differences in workers compensation systems by state.

¹³ The eight class codes listed below were included in the constructed outcome variables. The following five are the most likely to contain nurses:

- Code 8824—Retirement Living Centers: Health Care Employees
- Code 8829—Convalescent or Nursing Home—All Employees
- Code 8833—Hospital: Professional Employees
- Code 8835—Nursing—Home Health, Public and Traveling—All Employees
- Code 8841—Nursing Home: Professional Employees

Because Code 8829 contains all employees, the three class codes below were included for consistency:

- Code 9047—Nursing Home: All Other Employees
- Code 8825—Retirement Living Centers: Food Service Employees
- Code 8826—Retirement Living Centers: All Other Employees

¹⁴ At the time this analysis was performed, a full year of data for 2007 was only available at a first report. Therefore, first report data was used so consistent data for all three years could be included in the study.

¹⁵ Average wages for nursing care facilities (NAICS Code 6231) is from the Quarterly Census of Employment and Wages (QCEW) produced by the Bureau of Labor Statistics. For each facility, data was used for the corresponding ownership (either private or government) and state. Because data from the QCEW is available quarterly only, the wages were prorated to most closely match payroll data for each policy effective period.

¹⁶ Ratios that are based on incomplete years may serve as an approximation for the annual values because workplace injuries related to lifting are not subject to seasonality.

¹⁷ Paid loss data was used in this study because it is actual data, whereas paid plus case data would be impacted by differences in reserving practices.

The Models: A Technical Discussion

Technically, the estimated models can be described as being repeated measurement Tobit¹⁸ models with random effects at the unit of measurement (the institution) and fixed effects on the level of the ownership type. The outcome variables¹⁹ are frequency (defined above as claims per full-time equivalent worker at an annual rate) and total costs (defined above as total paid losses divided by payroll at an annual rate) for 2005 at first report, 2006 at first report, and 2007 at first report. The standard set of covariates includes:

- Statewide frequency (to control for differences in the workers compensation systems across states)
- The safe lift index
- The number of lifts per 100 residents
- Ownership structure (not-for-profit, for-profit, and government)

In the model we excluded facilities that did not pass a “time check” for the year in question. So if the calculated outcome variable at an annual rate for a given year was based on data for less than 90 days, that facility was excluded for that year.

We also only included in the models facilities that answered in the survey that their safe lift program has been operational for more than three years. This was to address the fact that we are including 2005 and 2006 in the models, and the variables in the safe lift index are for the point in time of the survey (November 2007 through May 2008). The rationale is that if they have had a safe lift program for more than three years, then their answers to those questions would be more likely to apply to 2005 and 2006 than for the facilities that have had a safe lift program for less than one year or for between one and three years.

Exhibit 7 contains two tables showing the distribution of facilities. The first is for the status of their safe lift program, and the second is for the length of time it has been operational. The 209 Directors of Nursing (or almost 79%) who answered that they “routinely use powered lifts” were then asked the length of time that their lift program had been operational. The models considered the 128 facilities (or 48%) where the powered mechanical lift program has been operational for “more than three years.”²⁰

By limiting the study to only those facilities where safe lift programs have been in effect for more than three years, the models are not measuring the association between the presence or absence of a lift program and workers compensation injuries and costs. Instead the models are measuring the impact of differences in the implementation of those programs and workers compensation costs. This seems appropriate because the surveys indicated that the vast majority of facilities reported that they had a safe lift program in place. Therefore, the relevant policy question is related to implementation rather than whether a safe lift program is in place.

¹⁸ A Tobit model is a type of censored regression model. This approach is appropriate when there is a clustering of observed values at an upper or lower boundary. In this case, there is a lower limit of zero, reflecting the fact that several of the long-term care facilities had no claims.

¹⁹ Outcome variables are often referred to as the dependent variables.

²⁰ After considering the two mentioned constraints and missing values, the models ultimately contained 119 facilities.

Exhibit 7

Distribution of Facilities

Status of Lift Program and Length of Time Operational

PML Program	Frequency	Percent	Cumulative Frequency	Cumulative Percent
N/A	9	3.4	9	3.4
No safe lift program	17	6.4	26	9.8
Still in the planning stage	13	4.9	39	14.7
Implementation in process	17	6.4	56	21.1
Routinely use powered lifts	209	78.9	265	100.0

PML Time Operational	Frequency	Percent	Cumulative Frequency	Cumulative Percent
N/A	56	21.1	56	21.1
Less than one year	18	6.8	74	27.9
One to three years	63	23.8	137	51.7
More than three years	128	48.3	265	100.0

Statistical Model

The frequency and total cost measures, which serve as the dependent variables, are left-censored at zero. This is because even the safest facility cannot record values of less than zero for frequency and total costs. Put differently, even if one facility is safer than a facility that routinely has zero frequency and zero total costs, the safer facility cannot do any better. The left-censoring within a standard regression approach is addressed in a Tobit model.

The data set comprises three years of measurement, but the panel is unbalanced. This is because not all facilities enter the data set with three measurements: some facilities are measured twice, and others are measured only once. Repeated measurement calls for random effects at the level of the facility.

Results

The data set comprises three years (2005 through 2007) and, after the mentioned exclusions, a total of 317 observations. The number of facilities equals 119. Appendix C contains a table of the number of facilities included in the models by state and ownership type.

Exhibit 8 shows the results of the frequency model. For frequency, both statewide frequency and the safe lift index matter with signs as expected; that is, higher values of the safe lift index are associated with lower values for frequency, and facilities in states with higher statewide frequency tend to have higher frequency. Although the number of safe lifts per 100 residents is not statistically significant, an analysis of variance on the influence of the safe lift program (that is, the joint influence of the safe lift index and number of lifts per residents) delivers statistically significant results. The ownership structure of the facility is not statistically significant, a finding that will be discussed below.

In terms of the magnitude of the impact of changes in the explanatory variables on frequency:

- A 1% increase in lifts per 100 residents is associated with a 0.3% decrease in frequency.
- A 1 standard deviation increase in the safe lift index is associated with a 49 percent reduction in frequency.
- A 1% increase in statewide frequency is associated with a 1.9% increase in frequency.
- For-profits have a 36 percent lower frequency than not-for-profits.
- Government facilities have an 11 percent lower frequency than not-for-profits.

Exhibit 9 displays the findings for the total cost model. Due to a high degree of skewness in the nonzero observations of total costs, the square root is applied to this dependent variable. Exhibit 9 shows that both statewide frequency and the safe lift index have the expected signs and are statistically significant. Here too, the number of safe lifts per 100 residents is not statistically significant, but an analysis of variance of the influence of the safe lift program shows that the safe lift index and the number of lifts per resident are statistically significant when tested jointly. Unlike in the frequency model, the ownership structure of the facility is statistically significant. Changes in the explanatory variables have the following impact on total costs:

- A 1% increase in lifts per 100 residents is associated with a 0.7% decrease in total costs.
- A 1 standard deviation increase in the safe lift index is associated with a 33 percent reduction in total costs.
- A 1% increase in statewide frequency is associated with a 5.3% increase in total costs.
- For-profits have 51 percent lower total costs than not-for-profits.
- Government facilities have 51 percent lower total costs than not-for-profits.

A possible reason for the weak statistical evidence for the role of the ownership structure of the facilities for frequency and total costs may be related to the influence of the ownership structure being encompassed in the safe lift program. In this case then, although ownership structure may be a major determinant of the safe lift program (which manifests itself primarily in the safe lift index, as indicated by the regression results), there may be little additional effect of the ownership structure on frequency and total cost. To investigate this hypothesis, the safe lift index is modeled as a function of the ownership structure. Because there is no time variation in the safe lift index (nor in any of the covariates explaining this dependent variable), the observations in this regression approach comprise the year 2007 only. Exhibit 10 shows the regression results for the safe lift index.

Due to having only one year of data, the number of observations is low, which implies large standard errors for the regression coefficients. These large standard errors make it difficult to obtain statistically significant results. Yet, the lack of statistical significance should not be taken as evidence that these covariates have no effect, as the absence of evidence is not evidence of absence.

Gelman and Weakliem (2008)²¹ offer a way of evaluating covariates that do not turn out statistically significant in small samples. The parameter estimate and its standard error are fed into a normal likelihood, which is then multiplied by a prior density to obtain a posterior density of the regression coefficient. The prior density is a Cauchy distribution (with a location parameter of zero), the scale parameter of which is calibrated such that the expected magnitude of the effect of the covariate (under the hypothesis that there is an effect) defines the upper and lower bounds within which 90 percent of the probability mass of the Cauchy distribution is located.

The reason of using a Cauchy distribution is its comparatively flat tails. If the effect is indeed larger than expected, the Cauchy would allow for that (the flatness of the tails implies a near-uniform density out in the tails).

When evaluating the regression coefficients in Exhibit 10, we find that there is a 76 (69) percent probability that the safety index at for-profits (government institutions) is higher than the safety index at not-for-profits. The probability of 0.76 (0.69) translates into an odds ratio of $0.76/(1-0.76)$ [$0.69/(1-0.69)$]. Put differently, the odds of the regression coefficient being greater than zero are about 3.2:1 (2.2:1).

²¹ Gelman, Andrew, and David Weakliem (2008) "Of Beauty, Sex, and Power: Statistical Challenges in Estimating Small Effects," <http://www.stat.columbia.edu/~gelman/research/unpublished/power4r.pdf>.

Exhibit 8

Frequency Tobit Model

Explanatory Variable	Coefficient	Standard Error	Significance
(Intercept)	-0.1634	1.1173	
Lifts Per Resident	-0.0741	0.0536	
Safe Lift Index	-0.1733	0.0399	***
State Frequency	2.7310	0.8335	***
For-profit	-0.8190	0.4350	*
Government	-0.2378	0.6941	
(Log of scale parameter)	0.7410	0.0598	***

No. of observations: 317

No. of positive observations: 216

Log likelihoods: -542.6 (model); -655.1 (intercept only)

Chi-squared (58.8): 225.13 ***

Analysis of variance of safe lift program:

Chi-squared (2): 26.45 ***

Analysis of variance of ownership structure:

Chi-squared (2): 4.19

Note: ***, **, * significant at 1%, 5%, and 10% levels, respectively

Exhibit 9

Total Cost Tobit Model

Explanatory Variable	Coefficient	Standard Error	Significance
(Intercept)	-0.1465	0.2283	
Lifts per Resident	-0.0101	0.0110	
Safe Lift Index	-0.0209	0.0082	**
State Frequency	0.4995	0.1703	***
For-profit	-0.1744	0.0887	**
Government	-0.1713	0.1430	
(Log of scale parameter)	-0.8347	0.0549	***

No. of observations: 317

No. of positive observations: 213

Log likelihoods: -196.3 (model); -275.9 (intercept only)

Chi-squared (56.6): 159.21 ***

Analysis of variance of safe lift program:

Chi-squared (2): 13.91 ***

Analysis of variance of ownership structure:

Chi-squared (2): 6.15 **

Note: ***, **, * significant at 1%, 5%, and 10% levels, respectively

Exhibit 10
Safe Lift Index Model

Explanatory Variable	Coefficient	Standard Error	Prob(H0 is false)
(Intercept)	0.9559	0.9157	---
For-profit	1.2300	1.0953	0.759
Government	1.6610	1.7242	0.688

No. of observations: 104
R-squared: 0.015
F-statistic (2,101): 0.765

Implications

The statistical model indicates that the index capturing a range of characteristics of a safe lift program is clearly related to differences in workplace injuries as measured by frequency and total workers compensation costs. Exhibit 11 indicates the 11 variables that best predicted safe lifting practices. Variables are retained in the table if they correlate at about .5 or more with one resulting underlying factor and less than .4 on other factors. Together these factors explain 65% of the variation in the index which is correlated with improvements in workers compensation outcomes.

What does this mean in trying to evaluate potential workplace safety involving the lifting of patients? Not surprisingly, one of the most critical components is that the institutions have a comprehensive set of policies and procedures regarding powered mechanical lifts. These include having procedures specifying that powered mechanical lifts should be used for residents not able to move around on their own. Specifying the use of powered mechanical lifts in the residents' care plans is also important. Training newly hired CNAs in the use of lifts and incorporating lift use in performance evaluations are other important factors.

Also important are the preferences of the Director of Nursing. Things that correlate highly with this factor include whether two caregivers may lift a resident manually and if the DON prefers the use of powered mechanical lifts when moving residents from bed to chair and vice versa.

Physical barriers also explain some of the variation. These include things such as the difficulty of using powered mechanical lifts in the residents' bathroom, whether residents are concerned about falling during a lift, and maintenance issues. Finally, enforcement of the lift policy also is a factor.

Exhibit 11

Factors in the Safe Lift Index and the Eleven Variables With the Highest Correlation to Those Factors

Variable	Factors			
	(1) Policies and Procedures	(2) DON Preferences	(3) Barriers	(4) Enforcement
For residents not able to move around on their own, do procedures require powered mechanical lift use?	.770			
For residents not able to move around on their own, do their care plans require the use of powered mechanical lifts?	.777			
When a CNA's job performance is being evaluated, how often is the use of powered mechanical lifts mentioned?	.472			
Are newly hired CNAs trained in how to use powered mechanical lifts?	.811			
May two caregivers lift a resident manually?		.667		
DON preference for PMLs to move from bed to chair (or vice versa) for residents weighing 150 pounds.		.782		
DON preference for PMLs to move from bed to chair (or vice versa) for residents weighing 90 pounds.		.786		
DON perception of barriers: difficult to use in the residents' bathrooms.			.719	
DON perception of barriers: resident concern about falling during a lift.			.810	
DON perception of barriers: maintenance/battery/sling problems.			.755	
Stringency of lift policy enforcement: if the policy is violated, is the employee fired, suspended but not fired, warned but not suspended or fired, or retrained only?				.929

Conclusion

After controlling for ownership structure and differences in workers compensation systems across states, the statistical analysis performed as part of this study shows that an increased emphasis on safe lift programs at long-term care facilities is associated with fewer workplace injuries and lower workers compensation costs. More precisely, higher values of the safe lift index are associated with lower values for both frequency and total costs. The safe lift index captures information on the policies, training, preferences, and barriers surrounding the use of powered mechanical lifts. The institution's commitment to effectively implementing a safe lift program appears to be the key to success.

Indeed, eight of the eleven variables making up the safe lift index reflect the rigor of policies, the role of training, the policy preferences of the Director of Nursing, and the stringency of the facility's enforcement of its policies. Having powered lift equipment is a necessary but not a sufficient condition. Since the statistical analysis only includes facilities with safe lift programs that have been operational for more than three years, this study captures not just the impact of the presence of powered mechanical lifts but also the degree of emphasis placed on the actual implementation of a safe lift program at long-term care facilities.

TECHNICAL APPENDIX A

Examples of Survey Questions

Policies and Procedures

- May one/two caregiver(s) lift a resident?
- Are powered mechanical lifts (PMLs) mentioned in procedures?
- Do procedures encourage or require use of PMLs for residents who can't move on their own or are over 250 pounds?
- Policy manual updated in last three years to include reference to PMLs?

Caregiver Training

- Are new CNAs trained in use of PMLs including changing batteries, lifting someone, and being lifted themselves?
- Are lists maintained showing training completion?
- Do caregivers take yearly or more frequent refresher training?
- If CNAs don't take PML training, are they allowed to lift residents?
- How do CNAs participate in lift program (serve on committees, train others, participate in accident investigations, give presentations)?

Resident Lift-Assist Identification

- When are resident lift-assist needs evaluated (on admission, every two to three months, with change in health status)?
- How are lift-assist needs identified (sign outside room, inside room, in formal care plan, in informal documentation)?
- Use physical functioning seven-day look back to identify which residents need a PML, given bed mobility and transfer status?
- Who identifies changes in resident lift needs (charge nurse, physical therapist, CNA, etc.)?
- How does a caregiver learn about a change in resident lift needs?

Use of Powered Mechanical Lift Equipment

- Do procedures and care plans require PMLs be used for residents who can't move around on their own?
- How often do caregivers use PMLs when lifting or transferring resident who can't move on their own?
- How many residents need full lifts? Sit-stand lifts?
- Are specific staff members assigned responsibility for elements of lift program (training, lift-need identification, battery changing, resident satisfaction, troubleshooting)?
- Are these responsibilities written into job descriptions and included as performance elements?
- When CNA and DON are evaluated, how often is use of PMLs mentioned?
- How are violations of safe lifting procedures identified?
- How are persistent lift violations addressed (retraining, warning, suspension, termination)?
- How is the state of the powered mechanical lift program described (don't have one, still in planning stage, implementing, routine use)?
- If routine use, how long operational (less than a year, one to three years, more than three years)?

Safety and Injury Reporting Procedures

- Send safety reports to administrator?
- Do reports contain information on resident injuries? CNA injuries? Was resident lifting involved?
- How often do reports mention whether PMLs were being used?
- How often are workers compensation reports reviewed? Do they show how many injuries were lift-related?
- Prepare reports for administrator on number of residents requiring lifts, share of caregivers trained in lift use, usage problems with lifts?

Staff Retention and Turnover

- Facility use consistent assignment staffing (same CNAs assigned to same residents)?
- Number of CNAs and contract/agency aides in past week?
- Number of CNA vacancies in past week?
- Number of CNAs hired and terminated in last three months?
- Number of CNAs with overtime shifts in past week?
- Number of CNAs at beginning of year still employed at end of year?
- Number of DONs in last three years?
- Subjective amount of CNA turnover (a lot, some, a little, none)?

Attitudes About Lifts

- Much prefer a PML, prefer a PML, no preference, prefer manual lift, much prefer manual lift for:
 - Resident over 250 pounds from bed to chair
 - 150-pound resident bed to chair
 - 130-pound resident from floor after a fall
 - 90-pound resident from bed to chair
- How likely call inspectors' attention to safe lift program during a state inspection?

Barriers to Adopting a Policy that Encourages or Requires the Use of PMLs

- None, weak barrier, moderate barrier, strong barrier, very strong barrier for:
 - Time to find a PML
 - Time to use a PML
 - Maintenance/battery/sling problems
 - Difficulty in training temporary personnel
 - Staff resistance to change
 - Resident concern about falling during a powered mechanical lift
 - Perception that the PML is too impersonal
 - Not enough space to use PMLs in rooms
 - Not enough space to use PMLs in bathrooms
 - Not enough space to store PMLs

CNA Injury and Turnover

- How many CNAs injured or reinjured in lift-related accidents in the past year?
- In the past year, how many CNAs left job for at least a month due to a lift-related accident?
- How many residents injured in the past year in lift-related incidents?

TECHNICAL APPENDIX B

Methodology for the Safe Lift Index Developed by Researchers at the University of Maryland School of Medicine²²

The goal in constructing a safe lift index is to reduce the number of variables required to measure the construct “safe lifting,” choosing only those that best predict the underlying construct of “safe lifting.” The questionnaire contained many questions in each of the following areas:

- Policies and procedures regarding powered mechanical lifts (PMLs)
- Certified nursing aide (CNA) training on PML
- Identification of resident lift needs for PML
- Potential barriers to PML use
- DON preferences for PML use

The first step in the variable elimination process was to exclude those that exhibited little or no relation to one another. We examined correlations, using both Pearson and Spearman correlations, and retained those that correlated well: $r > .2$ and $p < .05$ with variables across and/or within categories.

We transformed variables into z scores, since they did not all have the same response options.

To determine whether we could further reduce the number of variables and whether separate factors existed within the scale, we used a factor analysis. The Kaiser-Meyer-Olkin (KMO) statistic (.731) indicated that the data would support factor analysis. We chose principal components analysis, and varimax rotation. Four factors having an eigenvalue (the variances extracted by the factors) of 1 or higher were retained. Together these factors explain 65% of the variance of the safe lift index. Eleven variables that correlated .5 or more with one resulting underlying factor and less than .4 on other factors were retained (Cronbach's Alpha .749) and added together to form the index. See Exhibit 11 for the eleven variables included in the index.

The safe lift index could be used to predict outcomes, and since it is a single variable, fewer degrees of freedom (number of values in the final calculation of a statistic that are free to vary) are lost, important when small samples are analyzed.

²² Based on correspondence with Patricia Gucer, University of Maryland School of Medicine, 2010.

TECHNICAL APPENDIX C

Number of Facilities Included in Models by State and Ownership Type

ST	For profit	Government	Non profit	Total
AR	1			1
AZ	2			2
CO	3		3	6
CT			1	1
DC			1	1
FL	3		3	6
IA	19		8	27
ID	2	1		3
IL	12		3	15
IN	5			5
KS	2		2	4
KY	2		3	5
MO	4	1		5
MS	2			2
NE	3	7	3	13
NH	1		1	2
NM	1		1	2
OK	5			5
RI	2		1	3
SC	2			2
SD		1	5	6
TN	1	1		2
VT			1	1
Total	72	11	36	119

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