Medical Cost of Workers’ Compensation Claims Related to Patient Handling and Mobility Tasks Within Skilled Nursing Facilities, Continuing Care Retirement Communities and Assisted Living Facilities

An Exploratory Analysis

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Objective: Evaluate the medical costs related to patient handling & mobility (PH&M) claims. Methods: Closed medical only and indemnity workers’ compensation claims were utilized for this exploratory study. In addition to the PH&M tasks, the claimants’ gender, age, tenure, and the claim lag time were also analyzed. Results: Generalized linear models indicated that variables related to tasks, claims’ number of open days and age of the claimants had meaningful effects on the adjusted medical costs for medical only claims. For indemnity claims, the number of open days of claims, age and tenure had meaningful effects. Gender had meaningful effects only for indemnity claims when classifying the claims by patient handling tasks versus non-patient handling tasks. Conclusions: Results showed that factors, other than the type of injury; meaningfully influenced the adjusted medical costs of indemnity claims.

Keywords: long term care, medical costs, musculoskeletal injuries, patient handling, workers’ compensation

It is well known that the healthcare industry in the United States is one of the industries with the highest rates of nonfatal occupational injuries; including the industry’s subgroups nursing care facilities, continuing care retirement communities (CCRCs) and assisted living facilities. Musculoskeletal injuries during patient handling & mobility (PH&M) tasks tend to be one of the biggest contributors of occupational injuries and workers’ compensation claims. In addition, the healthcare industry is forecasting a shortage of nursing staff and an increase in the age of their nurses. As the workforce ages, the likelihood of injuries increases as the capacity to perform physical work diminishes and long-term care facilities are not exempt of these issues. Nursing assistants tend to have one of the highest ages, the likelihood of injuries increases as the capacity to perform PH&M tasks, the claimants’ gender, age, tenure, and the claim lag time were also analyzed.

RESULTS

METHODS

Conclusion: This study reviews the medical costs among closed medical only and indemnity workers’ compensation claim rates before and after its implementation. Over 80% of nursing homes experienced a decrease in patient handling claims. In a follow up study, Kurowski et al found that SPH&M programs reduced the recurrence of patient handling related injuries. Although the program’s effectiveness for reduction of musculoskeletal injuries is well known, its implementation may be challenging due to a variety of factors. In 2018, Powell-Cope et al performed a survey of 228 academic nursing programs which revealed that most programs included outdated patient handling techniques in their curriculums. Hurtado et al described the possible association of high turnover of nurses with low safe patient handling peer support. Elnitsky et al surveyed 51 U.S. Department of Veterans Affairs medical centers and found that programs with lack of organizational support may produce adverse patients events.

While many studies have outlined the benefits and challenges of SPH&M interventions, the same cannot be said regarding the medical costs associated with musculoskeletal injuries related specifically to PH&M tasks. This study reviews the medical costs among workers’ compensation claims associated with musculoskeletal injuries incurred during patient handling and mobility tasks within skilled nursing facilities, CCRCs and assisted living facilities.
policyholders with governing class codes (8824, 8825, 8826, 8829, 8841, 940, 960, 974 and 979) applicable to skilled nursing facilities, CCRCs, and assisted living facilities with accident dates between January 1, 2012 and December 31, 2018. This yielded a total of 10,342 single claims. After an initial review, 941 claims were removed because they were not related to long-term healthcare facilities and/or they had inconsistent information (eg, client stated hire date of injured worker was after the accident date), resulting in a total of 9401 claims. A second review was performed to remove claims with $0 dollars in medical expenses which resulted in an additional 1092 claims removed. Although some researchers may assume claims with $0 in medical costs is the result of claims with less severity; we partially disagree with that assumption. Employers may decide to pay the medical expenses related to a claim to avoid a negative impact to their experience modification rate. Some states like New Hampshire, US24 allow employers to pay up to $2000 in workers’ compensation medical treatments but other states do not have clear guidelines on whether employers can or cannot pay for such costs. Due to this inconsistency, it was decided to remove those claims with $0 in medical expenses because it was not possible to distinguish between claims with a true low severity and claims where the employers paid for medical treatment. At the end, a total of 8309 claims were analyzed. These claims were from all jobs within these healthcare settings and not specific to nursing staff. The scope of this study was to evaluate only the medical costs associated with the claims analyzed and; therefore, it should not be assumed the costs shown in this research article represent the total or net incurred costs of these claims. For claims classified as indemnity, only the costs associated with the medical treatment of the injury was analyzed. The logic behind this decision is that the total cost of indemnity claims includes medical costs plus indemnity payments as well as other expenses. Losses related to indemnity payments and/or other expenses may not be directly related to musculoskeletal injuries incurred during PH&M tasks. For example, if a policyholder has an informal or poor return to work program, the payments related to indemnity and/or expenses may be higher than those claims where the policyholder has a solid return to work program or if the policyholder can direct the care of the injured worker.25,26 Additionally, medical costs have been increasing over the years and it is estimated to account for 60% of all annual workers’ compensation costs.27 The data was retrieved in July 2019, therefore; any claims with accident dates between January 1, 2012 and December 31, 2018 with close or re-closed dates after July 2019 were not included. Data gathered were from 357 distinct policies and a total of 943 policy years.

Claims Classification
A total of 8309 claims were analyzed based on the cause, nature, and description of the injury. From that total, 2627 claims were classifiable as musculoskeletal injuries during PH&M tasks. PH&M related claims were classified in different groups to explore if any differences in their adjusted medical costs’ ranks were present. Initially, the claims were grouped by age group (16 to 24, 25 to 39, 40 to 54 and 55 or more), by work tenure (less than 1 y, 1 to 4 y, 5 to 9 y and 10 y or more) and by delayed report time. The report time or lag time represents the number of days between the date of the accident and the date that it was reported to the insurance carrier (0 to 3, 4 to 7, 8 to 14 d and 15 d or more). The purpose of including the report time was to evaluate if there were any effects on the medical costs of delayed reporting of the injury and therefore, its delayed medical treatment and/or management. Additionally, the claims were also grouped by PH&M task. The PH&M tasks classifications were:

1. Boosting, turning or repositioning in bed,
2. Boosting or repositioning in chair or wheelchair,
3. Catching a falling patient,
4. Recovering fallen patient from floor,
5. Showering or bathing,
6. Transfer from/to bed or stretcher,
7. Transfer to/from chair or wheelchair,
8. Transfer to/from toilet or commode.
9. All other PH&M tasks.

In addition to these PH&M tasks, musculoskeletal injury claims related to providing assistance during activities of daily living or ADLs were also included. Although assisting with activities of daily living may not always be considered PH&M tasks, these activities include manual handling of patients where the caregiver may absorb part of the patient’s weight.17,28 For this study, ADLs include ambulation (not including when a patient falls, whether caught or not) along with dressing/grooming and holding or lifting limbs. The claims related to transfers were classified based on the starting point of the PH&M task when the starting and end point of the transfer was mentioned. For example, if the description of the claim stated, “the employee injured her back while performing a transfer from the bed to a chair”, it was classified as transfer from/to bed or stretcher rather than transfer to/from chair or wheelchair. In addition, using the claims’ information; musculoskeletal injury claims were classified as “Ergonomics—Patient Handling & Ergonomics—Non-Patient Handling” based on the task being performed at the time of injury.

The medical costs for all claims were adjusted for inflation to June 1, 2020, using the Personal Health Care (PHC) index from the Bureau of Labor Statistics (BLS)29 for Medicare and Medicaid Services.29,30 This study was determined to be Exempt by the University of Southern Maine IRB and the Office of Research Integrity and Outreach (ORIO) pursuant to 45 CFR 46.104.

Statistical Analysis
The adjusted medical costs for the analyzed claims (both medical only and indemnity) were found to be lognormally distributed using Shapiro-Francia test for normality (P < 0.001) and histogram plots. Nonparametric analyses were performed using Wilcoxon rank sum test and Kruskal-Wallis rank test along with Dunn’s test, with Bonferroni correction instead of traditional parametric tests using log transformed data in order to avoid possible biased estimates.11,32 Additionally, generalized linear model analysis (glm, family (gamma), link (log))33,34 was performed to evaluate the influence of the variables analyzed to the adjusted medical costs. The effects of type of injury (categorical), gender (categorical), number of claims’ open days (continuous), age (continuous) & tenure (continuous) of injured workers as well as the lag time in which the claim was reported (continuous) on the adjusted medical costs were assessed. All statistical analyses, including the estimation of median costs and associated standard errors were performed using Stata software (v. 15.1; StataCorp, LLC., College Station, TX).

RESULTS
A summary of the medical costs for all the claims gathered within assisted living facilities, CCRCs and skilled nursing facilities are shown in Table 1. Ergonomic related claims accounted for 36.7% of all medical only claims and 47.1% of all the indemnity claims. Patient handling related claims had the highest proportion of all claims. The medical costs from medical only claims was approximately 93% of the total cost of the claims where the remaining 7% can be attributed to claims-related expenses. For indemnity claims, the proportion of medical costs accounted for over 50% of the total costs of the claims except for claims related to slips, trips and falls. These percentages were lower than what was previously reported by the National Council on Compensation Insurance (NCCI). The medical costs related to patient handling claims accounted for 34.4% of the total medical costs ($29,123,800).

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TABLE 1. Summary of Workers' Compensation Claims' Medical Costs Within Assisted Living Facilities, Continuing Care Retirement Communities and Skilled Nursing Facilities

| Major Type of Injury          | Number of Claims (n) | Proportion of All Claims (%) | Proportion of Medical Only Claims (%) | Proportion of Indemnity Claims (%) | Median Proportion of Medical Cost (Std. Err.) | Proportion of Medical Costs to the Total Cost of Medical Only Claims (%) | Proportion of Indemnity Claims to the Total Cost of the Claim (%) | Medical Costs (USD) | Indemnity Claims-Median Cost (USD) | Medical Only Claims-Median Cost (USD) |
|-------------------------------|----------------------|------------------------------|--------------------------------------|-----------------------------------|---------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------|-------------------------------------|-------------------------------|
| Ergonomics                    | 19.9%                | 14.1%                        | 15.1%                                | 92.9% (0.2%)                      | $3,991,400 ($452)                           | $449 ($19)                                                               | $2,420,000 ($303)                                                   | $1,643,800        | $1,863 ($203)                       | $1,863 ($203)               |
| Patient Handling              | 37.6%                | 25.9%                        | 21.4%                                | 92.9% (0.2%)                      | $3,991,400 ($452)                           | $449 ($19)                                                               | $2,420,000 ($303)                                                   | $1,643,800        | $1,863 ($203)                       | $1,863 ($203)               |
| Non-Patient Handling          | 19.9%                | 14.1%                        | 15.1%                                | 92.9% (0.2%)                      | $3,991,400 ($452)                           | $449 ($19)                                                               | $2,420,000 ($303)                                                   | $1,643,800        | $1,863 ($203)                       | $1,863 ($203)               |
| Slips, Trips and Falls        | 19.9%                | 14.1%                        | 15.1%                                | 92.9% (0.2%)                      | $3,991,400 ($452)                           | $449 ($19)                                                               | $2,420,000 ($303)                                                   | $1,643,800        | $1,863 ($203)                       | $1,863 ($203)               |
| Struck by/against/assault     | 19.9%                | 14.1%                        | 15.1%                                | 92.9% (0.2%)                      | $3,991,400 ($452)                           | $449 ($19)                                                               | $2,420,000 ($303)                                                   | $1,643,800        | $1,863 ($203)                       | $1,863 ($203)               |
| Other                         | 19.9%                | 14.1%                        | 15.1%                                | 92.9% (0.2%)                      | $3,991,400 ($452)                           | $449 ($19)                                                               | $2,420,000 ($303)                                                   | $1,643,800        | $1,863 ($203)                       | $1,863 ($203)               |

Medical costs shown were adjusted for inflation to June 1, 2020 using the PHC index. All medical cost shown were rounded.

As shown in Table 3, no meaningful differences were observed between the medical costs’ ranks for medical only claims arranged by age group. For all indemnity claims, the medical costs’ ranks where found to be meaningfully different except for age groups 40 and above. The median costs for both medical only and indemnity claims generally increased as the age group increased. The same pattern was not observed when looking at the claims by tenure group where the highest median cost for indemnity claims were observed in the 5 years to 9 years tenure group. This discrepancy can be attributed to the healthy worker survivor effect.35

The medical costs were also grouped by the time (number of days) in which the claim was reported. Most of the claims were filed within three days from the date of the injury. Generally, the median cost of the injuries did not increase with increased lag time, and therefore, delayed medical treatment.

Table 4 shows a summary of the medical costs for the different PH&M tasks. Overall, no meaningful differences were observed between the ranks of the medical costs associated within the specific PH&M tasks (where comparisons could be made). For medical only claims, the overall median claims’ cost of male claimants was found to be lower than their female counterparts. The opposite was observed for the indemnity claims, where the overall median cost for male claimants was higher than the female claimants.

Table 5 shows a summary of the general linear analysis for claims when grouped by the different types of injury. When compared to Other types of injuries, claims related to Ergonomics (patient and non-patient handling) and Slips, Trips and Falls had meaningful effects on the adjusted medical costs for medical only claims. This was not observed for indemnity claims. Claims from male claimants, when compared to female claimants; did not have a meaningful effect on the adjusted medical costs for medical only nor indemnity claims. The number of days in which the claim was open had meaningful effects for both medical only and indemnity of claims with the multiplicative factor being higher for medical only claims in contrast to the indemnity claims (1.0061 vs 1.0033). The age of the injured worker also had meaningful effects on the adjusted medical costs for both types of claims. In this case, the multiplicative factor for indemnity claims was higher than the medical only claims (1.0165 vs 1.0043). Regarding the tenure of the employee, a “reductive” meaningful effect was observed for indemnity claims but not for medical only claims. This can be attributed to the healthy worker survivor effect. No meaningful effects were observed for the delayed reporting of claims as well as the interactions effects between the variables gender and the types of injury.
## TABLE 2. Pairwise Comparison of Medical Costs’ Ranks by Injury and Type of Claim

| Medical Only Claims | Ergonomics—Patient Handling | Ergonomics—Non-Patient Handling | Slips, Trips and Falls | Struck by/against/aggression | Other |
|---------------------|-----------------------------|---------------------------------|------------------------|-----------------------------|-------|
| Ergonomics—patient handling | -                           | -                               | -                      | -                           | -     |
| Ergonomics—non-patient handling | NMD                        | -                               | -                      | -                           | -     |
| Slips, trips and falls       | NMD                        | NMD                             | NMD                    | NMD                         | NMD   |
| Struck by/against/aggression | ***                       | ***                             | ***                    | ***                         | NMD   |
| Other                   | ***                        | ***                             | ***                    | ***                         | NMD   |

### Indemnity Claims

| Medical Only Claims | Ergonomics—Patient Handling | Ergonomics—Non-Patient Handling | Slips, Trips and Falls | Struck by/against/aggression | Other |
|---------------------|-----------------------------|---------------------------------|------------------------|-----------------------------|-------|
| Ergonomics—patient handling | -                           | -                               | -                      | -                           | -     |
| Ergonomics—non-patient handling | NMD                        | -                               | -                      | -                           | -     |
| Slips, trips and falls       | NMD                        | NMD                             | NMD                    | NMD                         | NMD   |
| Struck by/against/aggression | ***                       | ***                             | ***                    | ***                         | NMD   |
| Other                   | ***                        | ***                             | ***                    | ***                         | NMD   |

Medical cost’s ranks comparison was performed using Kruskal-Wallis rank test. Post hoc test was performed using Dunn’s test with Bonferroni correction. Meaningful differences: differences between medical costs’ ranks; NMD, no meaningful difference with \(P\) value > 0.05; \(P < 0.05; \) \(P < 0.01; \) \(**P < 0.001.\)

Table 6 shows the main and interactions effects when grouping the claims by specific PH&M tasks. For medical only claims, none of the specific PH&M tasks had meaningful effects on the adjusted medical costs when compared to All Other Patient Handling & Mobility Tasks. The group for All Other Patient Handling & Mobility Tasks represents the claims related to PH&M tasks that could not be included into a specific PH&M task due limited information as explained in the Methods section. For indemnity claims, only claims related to Boosting or repositioning in chair or wheelchair had a meaningful reductive effect. This group had the lowest median values for both type of claims among all PH&M tasks as shown in Table 4. As in Table 5, the claims from male claimants were found not to have meaningful effects on the adjusted medical costs when grouping the claims by specific PH&M tasks. The

## TABLE 3. Summary of Patient Handling & Mobility Claims’ Median Adjusted Medical Costs by Gender, Age Group, Tenure and Report Time

| Medical Costs (USD) | Medical Only Claims | Medical Only Claims Median Cost (Std. Err.) (n) | Medical Only Claims Median Cost for Female Claimants (Std. Err.) (n) | Medical Only Claims Median Cost for Male Claimants (Std. Err.) (n) | Medical Only Claims Mean Medical Only Claims by Gender (Std. Err.) (n) | Indemnity Claims | Indemnity Claims Median Cost (Std. Err.) (n) | Indemnity Claims Median Cost for Female Claimants (Std. Err.) (n) | Indemnity Claims Median Cost for Male Claimants (Std. Err.) (n) | Indemnity Claims Mean Indemnity Claims by Gender (Std. Err.) (n) | Medical Only Claims by Gender | Indemnity Claims by Gender |
|---------------------|---------------------|-----------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|----------------|-----------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------|-----------------------------|
| Medical Only Claims | Medical Only Claims | Medical Only Claims Median Cost (Std. Err.) (n) | Medical Only Claims Median Cost for Female Claimants (Std. Err.) (n) | Medical Only Claims Median Cost for Male Claimants (Std. Err.) (n) | Medical Only Claims Mean Medical Only Claims by Gender (Std. Err.) (n) | Indemnity Claims | Indemnity Claims Median Cost (Std. Err.) (n) | Indemnity Claims Median Cost for Female Claimants (Std. Err.) (n) | Indemnity Claims Median Cost for Male Claimants (Std. Err.) (n) | Indemnity Claims Mean Indemnity Claims by Gender (Std. Err.) (n) | Medical Only Claims by Gender | Indemnity Claims by Gender |

*Medical costs’ ranks comparison was performed using Kruskal-Wallis rank test. Post hoc test was performed using Dunn’s test with Bonferroni correction. Comparison of medical costs’ ranks by gender was performed using Wilcoxon rank sum test. Medical costs shown were adjusted for inflation to June 1, 2020 using the PHC index. Data shown is from 357 distinct policies and 943 policy-years. n, number of claims; Std. Err., standard error. Meaningful differences: differences between medical costs’ ranks; NMD, no meaningful difference with \(P\) value > 0.05; \(P < 0.05; \) \(P < 0.01; \) \(**P < 0.001.\)
### TABLE 4. Summary of Claims’ Medical Costs Data by Type, Gender and Patient Handling & Mobility Tasks

| Patient Handling & Mobility Task | Medical Only Claims Median Cost (Std. Err.) (n) | Medical Only Claims Median Cost for Female Claimants (Std. Err.) (n) | Medical Only Claims Median Cost for Male Claimants (Std. Err.) (n) | Meaningful Differences Between Medical Only Claims by Gender | Indemnity Claims Median Cost (Std. Err.) (n) | Indemnity Claims Median Cost for Female Claimants (Std. Err.) (n) | Indemnity Claims Median Cost for Male Claimants (Std. Err.) (n) | Meaningful Differences Between Indemnity Claims by Gender |
|---------------------------------|-----------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------|
| ADLs                            | $805 ($191) (88)                             | $869 ($211) (79)                                                | $409 ($253) (9)                                                  | NMD                                                            | $2,411 ($455) (65)                             | $2,411 ($455) (63)                                               | $5,426 (NV) (2)                                                   | NC                                                              |
| Boosting or repositioning in chair or wheelchair | $758 ($71) (2.50)                            | $758 ($87) (24)                                                | $220 ($100) (9)                                                  | **                                                             | $2,019 ($232) (168)                             | $1,991 ($213) (162)                                               | $2,931 ($18,774) (6)                                              | NMD                                                            |
| Causing a falling patient       | $606 ($70) (1.45)                            | $608 ($70) (133)                                               | $449 ($187) (12)                                                 | NMD                                                            | $2,149 ($333) (105)                              | $2,130 ($320) (101)                                               | $6,365 (NV) (4)                                                   | NMD                                                            |
| Recovering fallen patient from floor | $522 ($264) (44)                            | $518 ($252) (37)                                               | $2079 ($501) (7)                                                 | NMD                                                            | $2,258 ($513) (24)                              | $2,223 ($431) (22)                                               | $7,956 (NV) (2)                                                   | NC                                                              |
| Boosting, turning or repositioning in bed | $801 ($832) (16)                            | $629 ($305) (15)                                               | $4,456 (NV) (1)                                                  | NMD                                                            | $2,666 ($1,146) (7)                              | $2,666 ($1,146) (7)                                               | $10 (NV) (0)                                                      | NC                                                              |
| Transferring from/to bed or stretcher | $666 ($108) (1.14)                          | $666 ($114) (110)                                              | $489 (NV) (4)                                                    | NMD                                                            | $2,562 ($875) (58)                              | $2,274 ($766) (54)                                               | $11,987 (NV) (4)                                                  | NMD                                                            |
| Transferring from/to chair or wheelchair | $525 ($134) (91)                            | $543 ($170) (84)                                               | $524 ($2,666) (7)                                                | NMD                                                            | $1,925 ($537) (60)                              | $1,959 ($538) (55)                                               | $913 ($8,455) (5)                                                 | NMD                                                            |
| Transferring from/to toilet or commode | $565 ($128) (63)                            | $673 ($515) (55)                                               | $4,19 ($971) (8)                                                 | NMD                                                            | $1,980 ($580) (50)                              | $1,887 ($545) (49)                                               | $5,182 (NV) (1)                                                   | NC                                                              |
| All other PH&M tasks            | $564 ($28) (73)                             | $567 ($30) (710)                                               | $472 ($112) (41)                                                 | NMD                                                            | $2,009 ($518) (486)                             | $1,993 ($514) (464)                                               | $2,589 ($987) (22)                                                | NMD                                                            |
| Median cost for all claims      | $598 ($25) (1.586)                           | $607 ($26) (1.486)                                             | $459 ($34) (100)                                                 | NMD                                                            | $2,062 ($875) (1,041)                            | $2,024 ($929) (994)                                               | $3,159 ($1,104) (47)                                              | NMD                                                            |

Meaningful differences: differences between medical costs’ ranks; NC, no comparison due to low number of claims in one of the subgroups; NMD, no meaningful difference with P value >0.05; *P < 0.05; **P < 0.01.

Medical costs shown were adjusted for inflation to June 1, 2020 using the PHC index.

n, number of claims; NC, no comparison; NV, no value; Std. Err., standard error.

Meaningful differences: differences between medical costs’ ranks; NC, no comparison due to low number of claims in one of the subgroups; NMD, no meaningful difference with P value >0.05; *P < 0.05; **P < 0.01.
### TABLE 5. Main and Interaction Effects of Major Types of Injury, Number of Claims’ Open Days, Number of Days of Delayed Reporting, Gender, Age and Tenure of Injured Workers to the Adjusted Medical Costs of All Injuries

| Major types of injury | Multiplicative Factor for Medical Only Claims ($e^b$) | Multiplicative Factor for Indemnity Claims ($e^b$) |
|-----------------------|-------------------------------------------------------|---------------------------------------------------|
| Ergonomics—patient handling | 1.3372*** | 1.0502 |
| Ergonomics—non-patient handling | 1.6113*** | 1.2576 |
| Slips, trips and falls | 1.2234*** | 1.1803 |
| Struck by/against/aggression | 1.0631 | 0.9868 |
| Other | Base | Base |

Gender of injured worker

| Number of days of delayed reporting | 0.9998 | 0.9998 |

Interaction effects between gender and type of injury

| Male & female | 0.8833 | 1.1517 |
| Male & non-patient handling | 0.7843 | 1.0739 |
| Male & slips, trips and falls | 1.0390 | 0.9683 |
| Male & struck by/against/aggression | 0.8870 | 0.7914 |

Values of multiplicative factors were rounded.

No meaningful interaction effects were observed between the variables task, age, tenure and claims’ open days.

### TABLE 6. Main and Interaction Effects by Gender of Type of Patient Handling Task, Number of Claims’ Open Days, Number of Days of Delayed Reporting, Age and Tenure of Injured Workers to the Adjusted Medical Costs of Patient Handling Injuries

| Patient handling task | Multiplicative Factor for Medical Only Claims ($e^b$) | Multiplicative Factor for Indemnity Claims ($e^b$) |
|-----------------------|-------------------------------------------------------|---------------------------------------------------|
| ADLs | 1.1084 | 0.9001 |
| Boosting or repositioning in chair or wheelchair | 0.9365 | 0.4933* |
| Boosting, turning or repositioning in bed | 1.1216 | 0.9473 |
| Catching a falling patient | 1.1127 | 1.2354 |
| Recovering fallen patient from floor | 1.2227 | 0.7046 |
| Showering or bathing | 1.2715 | 0.8569 |
| Transferring from/to bed or stretcher | 1.0336 | 0.9326 |
| Transferring from/to chair or wheelchair | 0.9535 | 0.9032 |
| Transferring from/to toilet or commode | 1.3556 | 0.0832 |
| All other patient handling & mobility tasks | Base | Base |

Gender of injured worker

| Number of days of delayed reporting | 1.0061*** | 1.0033*** |
| Number of claims’ open days | 1.0043*** | 1.0165*** |
| Age of injured worker | 1.0010 | 0.9883*** |

Interaction effects between gender and type of injury

| Male & female | 0.8624 | 1.4360 |
| Male & ADLs | Base | Base |

Values of multiplicative factors were rounded.

No meaningful interaction effects were observed between the variables task, age, tenure and claims’ open days.

## Statistical Methods

### Generalized Linear Model (GLM)

Generalized linear model (GLM) using gamma family with log link.

For medical only claims: Log likelihood — $-43614.04$, AIC = $115.97$, BIC = $-40404.29$.

For indemnity claims: Log likelihood — $-26760.60$, AIC = $18.82$, BIC = $-18640.80$.

Claims from female claimants were used as the base for interaction effects by gender.

No meaningful interaction effects were observed between the variables task, age, tenure and claims’ open days.

Values of multiplicative factors were rounded.

No meaningful interaction effects were observed between the variables task, age, tenure and claims’ open days.

Values of multiplicative factors were rounded.

Meaningful differences: only meaningful effects are denoted, *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$. 

### Data Sources

Data shown is from 357 distinct policies and 943 policy-years.

Medical costs used were adjusted for inflation to June 1, 2020 using the PHC index.

### Patient Handling Injuries

Claims from female workers were used as the base for interaction effects by gender.

Meaningful differences: only meaningful effects are denoted, *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$. 

Medical costs used were adjusted for inflation to June 1, 2020 using the PHC index.
number of days the claim was open had meaningful effects for both types of claims with the multiplicative factor being higher for medical only claims in contrast to the indemnity claims (1.0060 vs 1.0036). The age of the injured worker had a meaningful effect for indemnity claims but not for medical only claims. The same can be said for the tenure of the injured worker which also reflects the healthy worker survivor effect. The interactions between gender and specific PH&M tasks were evaluated and only the interaction between Male & Boosting, turning or repositioning in bed had a meaningful effect with a multiplicative factor less than 1 for medical only claims. The median cost of the medical only claims for male claimants in this group was lower than the median cost for female claimants as shown in Table 4.

Table 7 shows a third analysis where the claims were grouped in two categories: Patient Handling Tasks and Non-Patient Handling Tasks. The claims included in the Non-Patient Handling Tasks group included claims related to: Ergonomics—Non-Patient Handling, Slips, Trips and Falls, Struck by/Against/Agression and Others. For medical only claims, patient handling claims had a meaningful effect on the adjusted medical costs when compared to non-patient handling claims. This was not observed for the indemnity claims. The gender variable (male vs female claimants) had a meaningful effect only for indemnity claims and its predictive margins are depicted in Fig. 1. This meaningful effect by gender was not observed when grouping the claims in different arrangements. A possible explanation is that male claimants were exposed...
to higher risk and/or more forceful exertion during PH&M tasks than their female counterparts.

Like the prior regressions, the number of days the claim was open and age of the claimants had meaningful effects for medical only and indemnity claims with similar multiplicative factors. The predictive margins for the number of open days and age of the indemnity claims are depicted in Figs. 2 and 3. For indemnity claims, the tenure of the claimants also reflected the healthy worker survivor effect.

Regardless of how the claims were grouped for analysis, the regressions showed a similar pattern. The adjusted medical costs for medical only claims were meaningfully affected by the type of injury (with the exception of the regression when grouping the claims by specific PH&M tasks), the number of days in which the claims were open and the age of the claimants. In these cases, the variable related to the type of injury had the highest multiplicative factor and the age of the claimants had the lowest. For indemnity claims, the number of open days, age and tenure of the claimants had meaningful effects on the adjusted medical costs where the age had the highest multiplicative factor. Additional research may be needed to understand the influence of the injured workers’ age on the medical treatment costs of indemnity claims and if this influence is universal for all types of injuries or limited to musculoskeletal injuries.

Late reporting and therefore, late medical treatment, did not yield an increase in the claims’ medical costs. More studies may be needed to understand the role of late reporting in the medical costs.
needed to understand all the factors outside the scope of this analysis which may drive the total cost of claims when the injuries are not reported promptly.36,37

Unless required by the scope of their research, researchers analyzing the medical costs related to PH&M claims may benefit from grouping the claims by PH&M group (eg, boosting and transfers) rather than categorizing for each task (eg, transferring from/to bed or stretcher or transferring from/to chair or wheelchair, etc.). This most likely will increase the accuracy of claims classification and therefore increase the number of claims to be analyzed.

CONCLUSION

The results of this exploratory analysis showed the adjusted medical costs of the analyzed medical only and indemnity claims were generally influenced by different factors. For medical only claims, the costs were affected by the type of injury and to a lesser degree; the number of days in which the claim was open and the age of the claimant. For indemnity claims, it was the age of the claimant which mainly affected the medical costs except when looking at injuries related to patient handling and non-patient handling tasks. For this comparison, the gender of the claimant had the higher multiplicative factor affecting the costs. In an industry where most employees are female, male workers are often asked to perform higher risk and/or more difficult patient handling and mobility tasks. This can be seen as an indicator that there is room for improvement for some of the policyholders’ safe patient handling and mobility programs from where the analyzed claims were gathered. In addition to the age, the number of open days and the tenure of the claimants also meaningfully affected the medical costs of indemnity claims but at a lesser degree than the age of the claimant.

The researchers recommend that healthcare administrators, directors of nursing and safe patient handling committee members focus their efforts to minimize the potential hazard of workers having to absorb partial weight of the patients for any PH&M task and not only on those they may deem as dangerous. This analysis revealed neither the type of injury nor the specific PH&M task being performed were found to meaningfully affect the medical costs analyzed for the most serious (indemnity) claims.

An effective safe patient handling and mobility program will not only decrease musculoskeletal injury rates but also increase the retention of experienced workers in an industry that is showing signs of an aging workforce.14,38,39 Studies have shown that high retention of experienced workers in long-term healthcare facilities is associated with a lower number of deficiencies associated with Quality of Care.40,41

Limitations of the Data

Claims were classified based on the description provided by the policyholder at time of filing. Any errors or omissions by the policyholder could potentially produce a misclassification of the claim. The number of days a claim was open may include days that are not directly related to the treatment of the injury (eg, billing issues). The MEMIC Group provides PH&M interventions to its healthcare policyholders as part of its loss control services. These services include SPH&M programs include but not limited to; patient handling observations, fall recovery drills, and a full-day workshop along with ongoing program and committee support. Furthermore, The MEMIC Group asks its new and current healthcare policyholders’ commitment to implement or enhance its patient handling and mobility program including avoiding manually recovering patients from the floor. It is possible that these interventions had an influence on the number of claims submitted and medical costs of the claims reviewed in this study. Although the selected claims had a status of closed or re-closed, it is possible that some of the most recent claims had not yet reached their maturity and therefore, underestimating their final medical costs. The adjusted medical costs are based on the PHC index and it is possible that a different index would yield different adjusted medical costs. As stated previously, it is also possible that the medical costs for some claims analyzed were partially paid by the policyholders and therefore, their true medical costs may be underestimated.

ACKNOWLEDGMENTS

The authors would like to acknowledge The MEMIC Group’s Finance Department for their help regarding medical costs’ inflation adjustments, the Information Technology Department for their assistance collecting the claims’ information and feedback about statistical analyses and the Underwriting Department for their feedback about insureds’ governing class codes. Lastly, the authors would like to thank the members of MEMIC’s Healthcare Loss Control Team whose valuable comments enhanced the quality of this paper.

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