Original research

Evaluation of the Minnesota Safe Patient Handling Act: trends in workers' compensation indemnity claims in nursing home workers before and after enactment of the law

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ABSTRACT

Objectives The 2007 Minnesota Safe Patient Handling Act aims to protect healthcare workers from injuries caused by lifting and transferring patients. The effectiveness of the law in nursing homes is unknown. This policy evaluation measured changes in patient handling injuries before and after the law was enacted. Additionally, it assessed whether effects of the law were modified by facility levels of staffing and retention.

Methods Workers' compensation indemnity claims for years 2005–2016 were matched to annual direct care productive hours and facility characteristics (eg, profit status, hospital affiliation and region) for all Medicaid-certified nursing homes in Minnesota. Trends in patient handling claims were analysed using negative binomial regression with generalised estimating equations. The primary predictors were time period, staff hours per resident day and staff retention.

Results The patient handling indemnity claim rate declined by 25% in years 4–6 and 38% in years 7–9 following enactment of the law. Claims for all other injuries and illnesses declined by 20% in years 7–9 only. Associations between time period and patient handling claims did not vary by levels of staffing or retention. However, independent of time, facilities with annual retention ≥75% (vs <65%) had a 17% lower patient handling claim rate.

Conclusions Results suggest the law reduced patient handling claims in nursing homes. However, claim rates were elevated in facilities with low worker retention and those that were non-profit, not hospital-affiliated or in a non-metro area. Facilities with these characteristics may benefit from targeted state grants and consultation efforts.

Key messages

What is already known about this subject?
- In the USA, the effectiveness of safe patient handling (SPH) laws has only been evaluated in hospitals.
- Workers' compensation claims have declined in US nursing homes that electively implemented SPH programmes.

What are the new findings?
- Following enactment of a state law requiring SPH programmes in nursing homes, patient handling claims declined by 38%, and non-patient handling claims declined by 20% over 9 years.
- Independent of time, nursing homes with higher staff retention had a lower rate of patient handling claims.

How might this impact on policy or clinical practice in the foreseeable future?
- SPH laws may reduce patient handling injuries in nursing homes.
- Support of SPH laws should target nursing homes with high injury rates. In Minnesota, this includes those that are outside of major metropolitan areas, non-profit and not affiliated with hospitals.

INTRODUCTION

In the USA, several states have passed safe patient handling (SPH) laws designed to protect healthcare workers from disabling and potentially career-ending musculoskeletal injuries.[1 2] The effectiveness of SPH legislation in nursing homes has not been systematically evaluated. Minnesota is 1 of 12 states to pass an SPH law and 1 of only 6 to require the participation of nursing homes. The 2007 Minnesota Safe Patient Handling (MN SPH) Act requires each hospital, nursing home and clinical setting to adopt a plan to minimise manual lifting of patients by direct care workers through use of assistive equipment.[3]

SPH poses a particular challenge in nursing homes due to the frequency of resident lifts and transfers; high levels of resident acuity, frailty and combativeness; and small cluttered spaces.[4 5] In 2018, the rate of recordable injuries and illnesses in privately owned US nursing homes was 60% higher than the average across all healthcare and social assistance industries (6.2/100.0 vs 3.9/100.0 full-time equivalent workers (FTEs)).[6] Forty-two per cent of nursing home worker injuries resulting in lost time were musculoskeletal disorders (MSDs).[6]

The success of SPH programmes in nursing homes may be undermined by systemic understaffing and low worker retention. Minnesota law

requires a minimum of two nursing hours per resident day,[7] well below expert recommendations of 4.1–4.9 hours/resident day.[8] Further, annual staff turnover in US nursing home studies ranges from 74% to 100%.[9] Low staffing and high turnover are associated with elevated worker injury rates. In an Ohio study, the rate of back injuries was 32% higher with each additional resident per worker,[10] while a study in the eastern USA found that total injuries decreased by 16% with each hour of daily resident care.[11] In a large Washington nursing home, new workers (<21 days since hire) experienced a 2.6-fold risk of back or shoulder injury compared with established workers.[12] Qualitative studies demonstrate that low staffing and high turnover may impact injuries via reduced availability of coworkers to assist in transfers, reduced time to locate equipment and increased pace of work and stress.[13 14]

Pre–post studies of SPH programme effectiveness in nursing homes show declines in workers' compensation claim frequency and cost.[15–21] Programmes generally include a combination of explicit reduced-risk lift policy, equipment acquisition and training, hazard assessment, patient care planning, and/or use of an SPH coordinator or resource staff.[22 23] These studies focus on single facilities or healthcare systems that have electively implemented programmes in states without SPH legislation. To date, the effectiveness of state SPH laws has only been evaluated in hospitals.[24–27] To our knowledge, no study has evaluated the effects of an SPH law in nursing homes or assessed whether effectiveness is modified by levels of staffing and retention.

This statewide study of Minnesota nursing homes uses workers' compensation indemnity claims data to evaluate: (1) changes in patient handling injury rates following enactment of the MN SPH Act and (2) whether changes in patient handling injury rates over time vary by staff hours per resident day or staff retention. We hypothesise that, across Minnesota, patient handling injury rates declined from prelaw to postimplementation and that facilities with high staffing and retention experienced greater reductions in injury rates compared with facilities with low staffing and retention.

METHODS

Study design

In this policy evaluation, we examined injury trends in nursing homes between 2005 and 2016. The MN SPH Act required each nursing home to establish a written programme and committee by July 2008. The written programme must include (1) hazard assessment, (2) equipment acquisition, (3) staff training, (4) procedures to ensure building modifications are consistent with programme goals and (5) an evaluation plan. Beginning January 2011, the MN Occupational Safety and Health Administration can cite facilities for not effectively meeting programme requirements. To support the law, the Minnesota Department of Labour and Industry (MN DLI) provides ergonomic consultation and grant support of up to $10 000 annually.[3]

Study population and data sources

Nursing homes were eligible for inclusion if they reported data to the Minnesota Nursing Home Report Card between 2005 and 2016, including all three prelaw years (2005–2007). The Minnesota Nursing Home Report Card provides quality measures to help inform nursing home choice for Minnesota residents.[28] The dataset was matched to the Brown Long-Term Care Focus (LTCFocus) database using a US Centres for Medicare & Medicaid Services (CMS) identifier and to the Minnesota workers' compensation database using facility name and address. LTCFocus compiles US nursing home metrics, including data from the CMS Online Survey Certification and Reporting and Certification and Survey Provider Enhanced Reporting systems.[29] The Minnesota workers' compensation database records statewide indemnity claims, which are those that are qualified to receive payments for wage loss or permanent disability benefits. Typically, injured workers qualify for indemnity benefits after more than 3 days of work disability, including the day of injury. The final combined dataset was limited to direct care workers: certified nursing assistants, licensed practical nurses and registered nurses.

Variables

Time period

Time was categorised into 3-year periods: prelaw (2005–2007), implementation (2008–2010), first postimplementation (2011–2013), and second postimplementation (2014–2016). Each year was defined as 1 October–30 September to match the data collection period used for time at-risk estimates. Time was modelled categorically rather than continuously to capture the staged roll-out of MN SPH Act requirements.

Time at-risk

To measure time at-risk, we extracted annual productive hours for direct care workers for each facility from the Nursing Home Report Card and converted to FTEs using a conversion factor of 2000 productive hours per FTE year.

Staffing characteristics

From LTCFocus, we extracted annual staff hours per resident day (range .04–17) for each facility and dichotomised consistent with previous research (<4 vs ≥4 hours).[30] From the Nursing Home Report Card, we extracted annual direct care staff retention (staff employed 1 October–30 September divided by staff employed 1 October, range 0%–100%). As associations between staff turnover and care outcomes are non-linear,[9 31] we created retention tertiles at the 33rd and 66th percentiles (<65%, 65%–<75% and ≥75%).

Workers' compensation claims

From the workers' compensation database, we summed annual indemnity claims for each facility. For each claim, the injury or illness source, nature, event and body part were precoded by MN DLI staff using the Occupational Injury and Illness Classification System (OIICS).

We defined patient handling claims as those for which the injury or illness source was the resident, patient or client. Non-patient handling claims were defined as claims with any other sources. Non-patient handling claims were intended to serve as an internal comparator for trends in patient handling claims as we did not have access to external comparator data.

We used OIICS codes to create subcategories of patient handling and non-patient handling claims. MSDs were identified using nature and event codes, as specified by the US Bureau of Labour Statistics. Other subcategories were determined using the most common nature of injury or illness codes (ie, violence for patient handling claims and slips, trips and falls for non-patient handling claims).

Organisational characteristics

From LTCFocus, we also extracted the annual number of beds (range 1–495, dichotomised <100 vs ≥100), average resident acuity index (range .40–14; higher index reflects higher average

level of care), region (seven-county Minneapolis, St. Paul metro vs non-metro), profit status (for-profit vs non-profit), chain status (multifacility vs single site) and hospital affiliation (yes vs no). Variables were selected to capture differences in facility resources, management and resident case mix that may influence both staffing and resident care practices.[9 32 33]

Statistical analyses

Staffing and organisational characteristics

We characterised distributions and calculated means for staffing and organisational characteristics by time period. Crude associations between all characteristics and time were assessed using analysis of variance (ANOVA) for continuous variables and Pearson χ^2 tests for categorical variables.

Multivariable analysis

Calculation of injury rates

We modelled indemnity claim rates using negative binomial regression implemented in STATA V.15.[34] The unit of analysis was facility year. The outcome was the log of the annual claim count, and the predictor was the time period. FTEs were included as an exposure term to enable calculation of rates. Negative binomial models are a generalisation of Poisson regression appropriate when a discrete outcome exhibits overdispersion and zero inflation.[35] In our data, the facility-level annual claim count ranged from 0 to 18, with a mean of 1.3 (variance=3.0) and mode of 0 (claims=0 for 41% of facility years). Generalised estimating equations (GEEs) with an autoregressive correlation structure were used to account for dependence of annual claim count on facility (correlation ranged from 0.18–0.58). We used postestimation commands to estimate rates and 95% CIs (margins time period and predict (rate)) and to assess the main effect of time period on claim rate using Wald χ^2 tests (contrast time period).

Measures of association

We also used negative binomial regression with GEEs to model adjusted incident rate ratios for claim rate by time period for patient handling and non-patient handling indemnity claims. The primary predictors were time period, staff retention and staff hours per resident day. To assess whether the effect of time period on claim rate was modified by levels of staffing or retention, we tested interactions for time period×staff hours per resident day and time period×staff retention. We used postestimation commands to assess main effects and interactions (eg, contrast time period×staff retention). We included the following covariates, selected a priori based on literature and a directed acyclic graph, to control for potential confounding: number of beds, average acuity index, region, profit status, chain status and hospital affiliation.

RESULTS

Staffing and organisational characteristics

Of the 406 nursing homes that reported data to the MN Nursing Home Report Card between 2005 and 2016, 377 were eligible for inclusion (online supplementary figure 1). Twenty-seven were excluded because they did not report three prelaw years. Data from an additional two facilities were collapsed because multiple locations for a single employer could not be distinguished in the workers' compensation database. Of eligible facilities, 15 were missing a single year of productive hours and retention data and 2 were missing multiple years of data for all other covariates. These observations were treated as missing in analyses.

Characteristics of eligible nursing homes and p values from χ^2 and ANOVA tests for associations between each characteristic and time period are presented in table 1. Differences by time period were observed for staff retention (p<0.001), staff hours per resident day (p<0.001), total beds (p=0.017) and average acuity index (p<0.001). In later time periods, a lower proportion of facilities reported staff retention of ≥75%, while a higher proportion reported ≥4 staff hours per resident day. The number of total beds was lower and resident acuity was higher in later time periods. Distributions of annual FTEs, region, profit status, chain status and hospital affiliation were consistent over time.

Injury rates

Direct care workers filed 5891 indemnity claims during the study period. Of these, 3654 (62%) were patient handling claims and 2237 (38%) were non-patient handling claims (table 2). The main effect of time period was significant (p<0.001) for total claims, total MSDs and patient handling claims; claim rates for these outcomes declined steadily from prelaw to postimplementation. When claims were stratified by patient handling relatedness, the effect of time period was significant for patient handling MSDs (p<0.001) but not for non-patient handling MSDs (p=0.564). Similarly, declines in injuries to the back, shoulder and multiple body parts were observed for patient handling claims but not for non-patient handling claims. Online supplementary table 1 provides regression coefficients corresponding to rates presented in table 2.

From prelaw to second postimplementation, 209 individual facilities (55%) experienced a decline in patient handling claim rate and 166 (44%) experienced a decline in non-patient handling claim rate (data not shown). Among facilities that reported one or more claims during the prelaw period (ie, facilities that had 'room to improve,' n=328), 209 (64%) experienced a decline in patient handling claim rate and 166 (51%) experienced a decline in non-patient handling claim rate.

Measures of association

In unadjusted models, the claim rate declined significantly over time for patient handling injuries but not for non-patient handling injuries (table 3). Compared with the prelaw period, the patient handling claim rate was 24% lower in the first postimplementation period and 36% lower in the second postimplementation period.

In adjusted models, declines were observed in rates of both patient handling and non-patient handling claims (table 3). Compared with the prelaw period, the patient handling claim rate declined by 25% in the first postimplementation period and 38% in the second postimplementation period. The non-patient handling claim rate declined by 20% in the second postimplementation period only.

Associations between time period and claim outcomes were not modified by staffing or retention. Interaction terms were therefore excluded from models to allow interpretation of main effects. Controlling for time period (ie, the effects of the law) and other covariates, facilities with annual staff retention ≥75% had a 17% lower patient handling claim rate compared with facilities with <65% retention. Staff retention was not associated with non-patient handling claims. Further, staff hours per resident day was not associated with patient or non-patient handling claims.

The patient handling claim rate was 34% lower among metro facilities (vs non-metro), 37% lower among hospital-affiliated

Table 1 Staffing and organisational characteristics by time period, Minnesota nursing homes, 2005–2016 (n=377)

	Time period				
	Prelaw	Implementation	First post	Second post	
	2005–2007	2008–2010	2011–2013	2014–2016	
Variable	(n=377)	(n=377)	(n=374)	(n=363)	P value*
Staffing characteristics					
Staff retention, n (%)					
Tertile 1 (0%–<65%)	104 (28)	73 (19)	134 (36)	157 (43)	<0.001
Tertile 2 (65%–<75%)	157 (42)	160 (42)	131 (35)	135 (37)	
Tertile 3 (≥75%)	116 (31)	144 (38)	107 (29)	70 (19)	
Missing	0	0	2 (0.5)	1 (0.3)	
Staff hours per resident day, n (%)					<0.001
<4	359 (95)	327 (87)	329 (88)	298 (82)	
≥4	18 (5)	50 (13)	45 (12)	65 (18)	
Annual FTEs, mean (SD)	51.6 (34.5)	50.6 (33.0)	49.5 (32.6)	47.3 (32.0)	0.344
Organisational characteristics					
Total beds n (%)					0.017
<100	255 (68)	265 (70)	280 (75)	281 (77)	
≥100	120 (32)	112 (30)	94 (25)	82 (23)	
Missing	2 (0.5)	0	0	0	
Average acuity index, mean (SD)	10.0 (1.2)	10.1 (1.2)	10.8 (1.4)	11.1 (1.2)	<0.001
Region, n (%)					1.0
Metro †	106 (28)	106 (28)	105 (29)	103 (28)	
Non-metro	271 (72)	271 (72)	269 (72)	260 (72)	
Profit status, n (%)					0.558
For-profit	99 (26)	103 (27)	108 (29)	112 (31)	
Non-profit	276 (73)	274 (73)	266 (71)	251 (69)	
Missing	2 (0.5)	0	0	0	
Chain status, n (%)					0.729
Multifacility	188 (50)	195 (52)	196 (52)	197 (54)	
Single site	187 (50)	182 (48)	178 (48)	166 (46)	
Missing	2 (0.5)	0	0	0	
Hospital-affiliated, n (%)					0.513
Yes	59 (16)	53 (14)	46 (12)	46 (13)	
No	316 (84)	324 (86)	328 (88)	317 (87)	
Missing	2 (0.5)	0	0	0	

*P value based on Pearson χ^2 statistic for categorical variables and one-way analysis of variance F-test for continuous variables.
†7-county Minneapolis, St. Paul metro: Anoka, Carver, Dakota, Hennepin, Ramsey, Scott and Washington counties.
FTE, full-time equivalent worker.

facilities (vs not hospital-affiliated) and 14% lower among for-profit facilities (vs non-profit). The non-patient handling claim rate was 30% lower among metro facilities (vs non-metro), 39% lower among hospital-affiliated facilities (vs not hospital-affiliated) and 8% higher with each 1-point increase in average acuity index. Associations with total beds were not examined due to collinearity with FTEs.

DISCUSSION

In this evaluation of a state SPH law, we found earlier and greater declines in patient handling claims compared with non-patient handling claims in nursing homes. Compared with three prelaw years, patient handling claims declined by 25% in years 4–6 and 38% in years 7–9 following enactment of the law. In contrast, non-patient handling claims declined by 20% in years 7–9 only. Staffing and retention levels did not modify associations between time period and claims. However, independent of the law, high staff retention (≥75% vs <65%) was associated with a lower patient handling injury claim rate.

Few studies have evaluated SPH programme effectiveness in large samples of nursing homes. An Ohio study (n=887) evaluated the impacts of a state-sponsored ergonomics programme on back injury claims from 1995 to 2004.[10] Annual back claim rates ranged from 3.5 to 3.7/100.0 workers. Compared with preprogramme years, claims declined slightly in years 3–5 (RR=0.94, p=0.002) postimplementation. A second study of a nursing home chain in the eastern USA (n=136) assessed the effects of a corporate SPH programme on patient handling claims from 2003 to 2010.[15] Annual patient handling claim rates ranged from 5.7 to 9.3/100.0 workers. Compared with preprogramme years, claims declined substantially in years 1–3 (RR=0.68, 95% CI 0.64 to 0.72) and years 4–6 (RR=0.62, 95% CI 0.58 to 0.66) postimplementation.

Our study found lower rates of back claims (range 0.95–1.5/100.0 FTE) and patient handling claims (range 1.3–2.0/100.0 FTE). This is consistent with a national trend of declining injuries over the last two decades.[6] Additionally, the lower rates likely reflect exclusion of medical-only claims from our study,

Table 2 Workers' compensation indemnity claim count and rate by time period, direct care workers in Minnesota nursing homes, 2005–2016

	Prelaw		Implementation		First postimplementation		Second postimplementation		
	Count, n	Rate (95% CI)†	Count, n	Rate (95% CI)†	Count, n	Rate (95% CI)†	Count, n	Rate (95% CI)†	P value*
Total claims	1716	3.1 (2.8 to 3.4)	1678	3.0 (2.7 to 3.2)	1389	2.6 (2.4 to 2.8)	1108	2.2 (2.0 to 2.4)	<0.001
Total MSDs	1133	2.0 (1.8 to 2.2)	1081	1.9 (1.7 to 2.1)	878	1.6 (1.5 to 1.8)	708	1.4 (1.3 to 1.6)	<0.001
Patient handling claims									
Total patient handling	1121	2.0 (1.8 to 2.2)	1060	1.9 (1.7 to 2.1)	826	1.5 (1.4 to 1.7)	647	1.3 (1.1 to 1.4)	<0.001
MSD	981	1.8 (1.6 to 1.9)	923	1.6 (1.5 to 1.8)	711	1.3 (1.2 to 1.5)	553	1.1 (0.98 to 1.2)	<0.001
Violence	81	0.14 (0.11 to 0.17)	68	0.12 (0.09 to 0.15)	83	0.15 (0.12 to 0.19)	72	0.14 (0.10 to 0.18)	0.527
Other	59	0.10 (0.07 to 0.13)	69	0.12 (0.09 to 0.15)	32	0.06 (0.04 to 0.08)	22	0.04 (0.02 to 0.06)	<0.001
Body part									
Back	664	1.2 (1.0 to 1.3)	614	1.1 (0.96 to 1.2)	439	0.81 (0.70 to 0.91)	349	0.69 (0.60 to 0.78)	<0.001
Shoulder	109	0.19 (0.15 to 0.23)	130	0.23 (0.19 to 0.28)	98	0.18 (0.14 to 0.22)	72	0.14 (0.10 to 0.17)	0.010
Neck	21	0.04 (0.02 to 0.05)	16	0.03 (0.01 to 0.04)	13	0.02 (0.01 to 0.04)	9	0.02 (0.006 to 0.03)	0.330
Upper extremity	85	0.15 (0.11 to 0.18)	75	0.13 (0.09 to 0.17)	78	0.14 (0.11 to 0.18)	65	0.13 (0.10 to 0.16)	0.800
Lower extremity	48	0.08 (0.06 to 0.11)	51	0.09 (0.06 to 0.12)	35	0.06 (0.04 to 0.09)	33	0.07 (0.04 to 0.09)	0.338
Multiple	116	0.20 (0.16 to 0.24)	117	0.21 (0.17 to 0.24)	73	0.13 (0.10 to 0.17)	60	0.12 (0.09 to 0.15)	0.001
Other	78	0.13 (0.10 to 0.17)	57	0.10 (0.07 to 0.13)	90	0.16 (0.13 to 0.20)	59	0.11 (0.08 to 0.15)	0.030
Non-patient handling claims									
Total non-patient handling	595	1.1 (0.95 to 1.2)	618	1.1 (0.98 to 1.2)	563	1.0 (0.93 to 1.1)	461	0.93 (0.83 to 1.0)	0.132
MSD	152	0.27 (0.22 to 0.32)	158	0.28 (0.23 to 0.33)	167	0.31 (0.26 to 0.36)	155	0.31 (0.26 to 0.37)	0.564
Slips, trips and falls	230	0.40 (0.34 to 0.46)	290	0.51 (0.44 to 0.58)	247	0.45 (0.38 to 0.51)	176	0.35 (0.30 to 0.40)	0.001
Other	213	0.38 (0.32 to 0.44)	170	0.30 (0.25 to 0.35)	149	0.27 (0.23 to 0.32)	130	0.26 (0.20 to 0.31)	0.010
Body part									
Back	164	0.29 (0.24 to 0.34)	153	0.27 (0.22 to 0.32)	137	0.25 (0.21 to 0.30)	121	0.24 (0.20 to 0.29)	0.531
Shoulder	29	0.05 (0.03 to 0.07)	31	0.05 (0.04 to 0.07)	33	0.06 (0.05 to 0.08)	35	0.07 (0.05 to 0.09)	0.539
Neck	8	0.01 (0.004 to 0.02)	10	0.02 (0.006 to 0.03)	8	0.01 (0.005 to 0.02)	5	0.01 (0.001 to 0.02)	0.634
Upper extremity	75	0.13 (0.10 to 0.16)	72	0.13 (0.10 to 0.16)	60	0.11 (0.09 to 0.14)	58	0.12 (0.08 to 0.15)	0.708
Lower extremity	147	0.26 (0.21 to 0.30)	165	0.29 (0.24 to 0.34)	148	0.27 (0.22 to 0.32)	107	0.21 (0.17 to 0.25)	0.082
Multiple	123	0.21 (0.17 to 0.25)	121	0.21 (0.17 to 0.25)	96	0.18 (0.14 to 0.21)	79	0.16 (0.12 to 0.19)	0.124
Other	49	0.09 (0.06 to 0.11)	66	0.12 (0.08 to 0.15)	81	0.15 (0.11 to 0.18)	56	0.11 (0.09 to 0.14)	0.052

*P value for Wald χ^2 test for main effect of time period.
†Rate per 100 FTEs adjusted for dependence of observation on facility.
FTE, full-time equivalent worker; MSD, musculoskeletal disorder.

which comprise almost 80% of workers' compensation claims in Minnesota.[36] The decline in Minnesota patient handling claims was similar to data from the eastern USA and greater than reports from Ohio.[10 15] Participation in the Ohio programme was voluntary, potentially resulting in smaller effects on injuries over time. Though the Ohio study used Poisson regression and adjusted for overdispersion, it is unclear if either study accounted for zero inflation. Negative binomial modelling, used in our study, presents a promising method for the often-sparse workers' compensation data used in occupational injury research.

To date, evaluations of SPH laws have focused on hospitals. In Washington hospitals, the incidence rate of indemnity and medical-only workers' compensation claims declined by 10.1% (95% CI 8.0% to 12.3%) in the years surrounding enactment of an SPH law. In nursing homes, which were not subject to the law, claims declined by only 5.8% (95% CI 1.7% to 9.7%).[24] Over the 3 years a California SPH law was implemented, serial cross-sectional surveys of nurses indicated a decline in the prevalence of musculoskeletal symptoms (prevalence ratio=0.78, 95% CI 0.66 to 0.91) but no change in incidence of musculoskeletal injuries.[27] Differences in the laws' requirements complicate direct comparisons of their effectiveness. While Minnesota is the only state to require a written SPH programme, the law does not specify the right to refuse manual lifts or require lift teams. California does not require hazard assessments, programme effectiveness reviews or SPH committees, and Washington does not require ongoing worker education and training. Financial support also varies by state: Minnesota provides safety grants and Washington offers equipment tax credits (up to $1000 per acute care bed) and a workers' compensation premium discount.[1]

More research is needed to assess associations between staff retention and patient handling injuries. Our findings linking higher retention to lower injury rates are consistent with the eastern US study, which found a modest positive association between licensed practical nurse turnover and workers' compensation claim rate.[15] Retention may impact patient handling practices directly via staff time, consistency and experience. Alternatively, it is possible that retention and patient handling practices are both impacted by work environment (eg, unit culture and pace),[14] which was unmeasured in this study. If unmeasured confounding accounted for observed differences in claim rates, efforts to improve retention alone would not effectively reduce patient handling injuries.

Limitations

Factors other than the MN SPH Act, such as injury reporting or industry-wide safety trends, may have influenced changes in workers' compensation claims over time.[37] To address this, we compared trends in patient handling and non-patient handling claims. We found declines in patient handling claims were larger and occurred earlier following enactment of the law. However, we did not have access to an external comparator, ideally claims data from a state without an SPH law.

Our study did not evaluate the capacity of individual nursing homes to implement SPH programmes or level of programme

Table 3 Multivariable modelling of predictors of annual workers' compensation indemnity claim rate, direct care workers in Minnesota nursing homes, 2005–2016

	Patient handling claims		Non-patient handling claims	
Predictor	Unadjusted IRR (95% CI)	Adjusted IRR (95% CI)	Unadjusted IRR (95% CI)	Adjusted IRR (95% CI)
Time period				
Prelaw	Ref	Ref	Ref	Ref
Implementation	0.93 (0.84 to 1.04)	0.94 (0.85 to 1.05)	1.03 (0.91 to 1.16)	1.04 (0.92 to 1.17)
First post	0.76 (0.68 to 0.86)	0.75 (0.67 to 0.84)	0.98 (0.85 to 1.11)	0.92 (0.80 to 1.06)
Second post	0.64 (0.56 to 0.72)	0.62 (0.55 to 0.71)	0.88 (0.76 to 1.02)	0.80 (0.68 to 0.94)
Staff hours per resident day				
<4		Ref		Ref
≥4		0.97 (0.85 to 1.10)		0.89 (0.76 to 1.04)
Staff retention				
Tertile 1 (0–<65%)		Ref		Ref
Tertile 2 (65–<75%)		0.97 (0.88 to 1.07)		0.93 (0.83 to 1.04)
Tertile 3 (≥75%)		0.83 (0.74 to 0.94)		0.91 (0.79 to 1.05)
Average acuity index		1.01 (0.97 to 1.05)		1.08 (1.03 to 1.13)
Region				
Non-metro		Ref		Ref
Metro		0.66 (0.57 to 0.76)		0.70 (0.61 to 0.81)
Profit status				
Non-profit		Ref		Ref
For-profit		0.86 (0.75 to 0.99)		0.93 (0.81 to 1.06)
Hospital affiliation				
No		Ref		Ref
Yes		0.63 (0.50 to 0.80)		0.61 (0.34 to 0.84)
Chain status				
Single site		Ref		Ref
Multifacility		1.05 (0.93 to 1.20)		1.06 (0.94 to 1.20)

IRR, incidence rate ratio.

implementation. We were unable to assess whether facilities that met all requirements of the law experienced greater injury declines than those that did not. Rather, the study serves as a real-world evaluation of the MN SPH Act across all Medicaid-certified nursing homes in Minnesota. As requirements of SPH laws vary substantially,[1] results should not be generalised to other states.

The study was limited to measures available in the Minnesota workers' compensation database, LTCFocus and Minnesota Nursing Home Report Card. As previously discussed, the workers' compensation database does not record medical-only claims (those that are reimbursed for medical treatment but not wage loss or permanent disability).[36] While the results of our study indicate a decline in severe patient handling injuries as reflected by indemnity claims, the effect of the MN SPH Act on less severe injuries is unknown.

Finally, our multivariable models may be missing important predictors of patient handling injuries, including receipt of state safety grants, union participation, changes in nursing home ownership and additional resident characteristics (eg, body mass index) and staffing attributes (eg, average staff tenure).[10 15 38 39] However, the covariates we selected from LTCFocus are standardised across states and publicly available, making them good candidates for use in future SPH policy evaluations.

CONCLUSIONS AND RECOMMENDATIONS

In Minnesota, enactment of the MN SPH Act was associated with a substantial reduction in patient handling indemnity claims in nursing homes over 9 years. As all Medicaid-certified nursing homes in the state were included in the study regardless of level of SPH programme implementation, reductions in injury claims may be even greater in nursing homes with well-developed programmes. We found higher patient handling claim rates in nursing homes that had low worker retention and those that were in non-metro areas, non-profit or not affiliated with a hospital. Safety grants and consultation services, already offered by Minnesota state agencies, should target those facilities at increased risk for patient handling injury claims.

Nursing homes face unique challenges implementing mandated SPH programmes. They must balance resident safety and rehabilitation goals, manage Medicare and Medicaid reimbursements and meet complex state and federal quality regulations while remaining sustainable or profitable.[13] Given these complexities, administrators may not prioritise compliance with worker safety mandates. To reinforce their importance, worker safety and staffing metrics should be fully incorporated into nursing home quality regulations and consumer-facing reports, such as the Minnesota Nursing Home Report Card and Nursing Home Compare. Further, nursing homes should be held accountable to tracking and reporting these metrics to state and federal regulating bodies. As a larger proportion of the US population ages into long-term care in the coming years, research and outreach are needed to frame worker safety and well-being as essential elements of nursing home quality.

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