Impact of Safe Patient Handling Legislation on Musculoskeletal Disorders Among California Healthcare Workers

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Prepared by:
University of California, San Francisco
School of Nursing

Principal Investigator:
Soo-Jeong Lee, PhD, RN, FAAOHN

Co-Investigators:
Robert Harrison, MD, MPH
Joung Hee Lee, PhD, RN
Laura Stock, MPH

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DISCLAIMER

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LIST OF TERMS AND ABBREVIATIONS

ANA	American Nurses Association
BLS	Bureau of Labor Statistics
CDPH	California Department of Public Health
DIR	Department of Industrial Relations
DWC	Division of Workers' Compensation
FROI	First Reports of Injury
MSD	Musculoskeletal Disorder
NAICS	North American Industry Classification System
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupation Safety and Health Administration
OSHPD	Office of Statewide Health Planning and Development
PHI	Patient Handling Injury
QCEW	Quarterly Census of Employment and Wages
SD	Standard Deviation
SIC	Standard Industrial Classification
SROI	Subsequent Reports of Injury
U/E	Upper Extremities
WC	Workers' Compensation
WCIRB	Workers' Compensation Insurance Rating Bureau
WCIS	Workers' Compensation Information System

ABSTRACT

Healthcare workers are well known to be at high risk of musculoskeletal disorders (MSDs) from patient handling. In 2011, California passed the Hospital Patient and Health Care Worker Injury Protection Act (AB 1136) that requires acute care hospitals to implement safe patient handling policies and programs to prevent patient handling injuries (PHIs). In 2014, the California Division of Occupational Safety and Health (Cal/OSHA) established regulations to implement the safe patient handling law. We aimed to: (1) assess the impact of the safe patient handling law and regulation on MSD prevention at the state level and (2) explore workers' perceptions and experiences regarding the implementation of the safe patient handling policy, programs, and practices. We used two approaches: (1) quantitative analysis of workers' compensation (WC) data from 2007 to 2016 and (2) qualitative focus groups.

We identified 311,269 MSD claims that occurred in 2007-2016 in private, state, and local government healthcare facilities in California. MSD claims accounted for 40.3% of all claims among healthcare workers (n=772,897). Of the MSD claims, 40.2% were by hospital workers, and 28.1% were identified as PHI cases. It should be noted that due to methodological limitations, the number of PHI cases is highly likely to underestimate the true magnitude of PHIs. Compared to the pre-legislation period (2007-2011), MSD and PHI claims among hospital workers decreased 4% and 14%, respectively, during the post-legislation period (2012-2016). In contrast, those claims increased in nursing and residential care facilities, where the safe patient handling law does not apply. The reductions of annual claim rates among hospital workers during 2011-2016 were statistically significant and estimated to decrease by 3.3% per year for MSD claims (IRR=0.967, 95% CI 0.943-0.991, p=0.0086) and by 7.3% per year for PHI claims. (IRR=0.927, 95% CI 0.903-0.952, p<0.0001). The rate reduction of PHI claims was significantly greater than the rate change of non-PHI claims (p=0.003). Moreover, hospital workers showed a significantly greater rate reduction than nursing and residential care facility workers (p<0.0001). Among hospital nursing workers, MSD and PHI claims decreased by 8.0% and 17.0%, respectively, between the pre- and post-legislation periods, and the estimated reduction of claim rates per year during 2011-2016 was 4.3% for MSD claims (IRR=0.957, 95% CI 0.938-0.977, p<0.0001) and 8.5% for PHI claims (IRR=0.915, 95% CI 0.889-0.942, p<0.0001). Of the MSD claims among hospital workers, 79.2% were strains or sprains. PHI claims in back, upper extremities, and trunk showed apparent reductions during the post-legislation period. In 2008-2015, 52.1% of healthcare worker cases had medical bill data for data analysis; $598 million and $152 million were paid for medical bills of MSD claims and PHI claims among healthcare workers over the 8-year period.

Three focus groups were conducted with 21 nurses and patient handling staff recruited from 12 hospitals located in eight counties in the San Francisco Bay Area and San Joaquin Valley. The findings indicate that the participants had diverse and mixed experiences since the passage of the safe patient handling law. Positive experiences and perceptions include feeling more empowered to advocate for staff safety, awareness of safe patient handling policies and committee activities, increased provision and variety of lift equipment, more provision of training, and improvement in safety culture and practices including increased lift use. Perceived concerns and obstacles include continuing barriers to safe practices and lift use (e.g., difficulty in getting assistance, time burden associated with lift use, lack competence in using the equipment),

limited availability of lift teams, limited nursing employee input in the safety committee, increased workload and continuing injury concerns, and more punitive management about worker injury. Participants also indicated the need for more effective training, sufficient staffing, supportive environment for worker safety and well-being, and management support for injured workers.

In conclusion, our study identified positive changes of reductions of MSD and PHI claims among hospital workers after the passage of California safe patient handling legislation. These findings may indicate positive impacts associated with the safe patient handling law and regulations; however, due to the limitation of the descriptive observation study design, the positive changes may not be attributed to the law. Our study also described positive changes perceived by hospital workers and continuing challenges and barriers to address for improvement.

INTRODUCTION

The healthcare industry is the fastest-growing sector in the US and employs about 18 million workers, accounting for 11.4% of the US workforce.[1, 2] The healthcare industry has high rates of work-related injuries and illnesses. In 2017, 152,340 workers in the healthcare and social assistance private sector were away from work for a median of 6 days.[3] Such injuries and illnesses not only compromise the well-being and quality of work life of individual workers, but also pose a challenge in maintaining optimal staffing levels to provide high-quality and timely care.

Musculoskeletal disorders (MSDs) are a leading occupational health problem, accounting for over 30% of lost-time work-related injuries and illnesses in the United States.[4] Healthcare workers are well-known to be at high risk of MSDs. Every year, 30,000-37,000 nurses and nursing assistants lose work days because of MSDs, and the injured nurses are away from work for the median 8-9 days.[4] In 2013, nursing assistants and registered nurses ranked as the top 1st and 5th occupations, respectively, with the most cases of lost-worktime MSDs.[5] A 2011 survey by the American Nurses Association (ANA) showed that 56% of nurses had work-related musculoskeletal pain.[6] The annual prevalence of low back pain in nursing personnel ranges from 45% to 90% in US and international studies.[7-15] The resulting costs of MSDs among healthcare workers are enormous but the data are limited. As an old estimate, direct and indirect costs of back injuries in the US healthcare industry were estimated to be $7.4 billion (in 2008 dollars) annually.[16] The State of Washington reported that the total non-medical cost of work-related MSD claims in healthcare was approximately $395 million during 2002-2010.[17] The Oregon Occupational Safety and Health Administration reported that patient handling injuries among registered nurses cost the state over $14 million during 1997-2006, with an average of $16,090 per claim.[18] As such, MSD prevention is critically important to prevent and reduce personal pain and suffering, productivity loss, and economic and social burden to families and industry.

The primary risk factor for MSDs among healthcare workers is patient handling such as lifting, transferring, repositioning, and helping patients with mobility. Patient handling injuries (PHIs) account for 31-72% of musculoskeletal injuries [19-22] and 27-53% of workers' compensation costs among healthcare workers.[18, 21] A study analyzing injury reports from 112 U.S. health care facilities reported a PHI incidence rate of 11.3 per 10,000 worker-months.[23] Another study showed that work-related low back pain prevalence was two times higher among nurses who performed patient handling than nurses without patient handling duty.[12] The current epidemic of obesity and related increases of bariatric patients is expected to further elevate the risk of PHI.[24] Research evidence indicates that programs for PHI prevention need to use multifaceted strategies incorporating safe patient handling policy, patient handling equipment, lift teams, training, patient care ergonomic assessment protocols, peer leaders, and safe work practices.[25-36]

In recognition of the substantial problem of injuries from unsafe patient handling and the critical need for effective workplace interventions, state laws have been promulgated to protect healthcare workers. Since 2005, 11 states have passed safe patient handling legislation and most states require implementation of comprehensive safe patient handling policy and programs.[37] At the national level, federal bills, including the 2015 Nurse and Health Care Worker Protection Act

(H.R.4266), have been introduced but not passed.[38, 39] Along with this effort, the ANA led a national campaign for safe patient handling in 2003 and later developed the Safety Patient Handling and Mobility Interprofessional National Standards in 2013.[40]

In California, the safe patient handling law (AB1136 Hospital Patient and Health Care Worker Injury Protection Act) was passed on October 7, 2011 and became effective on January 1, 2012. To implement the law, the California Division of Occupational Safety and Health (Cal/OSHA) developed a specific regulation (General Industry Safety Orders §5120. Health Care Worker Back and Musculoskeletal Injury Prevention), which became effective on October 1, 2014.[41, 42] Research is needed to identify whether the policies and programs required by the safe patient handling laws and regulations are successfully implemented, how the policies and programs affect safety practices of workers, and whether the laws and regulations are effective in preventing MSDs among healthcare workers. There have been studies examining the effectiveness and outcomes of safe patient handling programs at the institutional level,[27, 29-31, 34, 36, 43, 44] but research evaluating the statewide impact of legislation has been very limited. Among 11 states with a safe patient handling law, Washington State (legislation in 2006) assessed the legislative impacts. They analyzed workers' compensation claims rates and conducted surveys of direct care staff and safe patient handling committee representatives compared to a control state of Idaho without safe patient handling legislation .[45] A 2011 report by the State of Washington showed decreased rates for all workers' compensation claims, back claims, and claims involving another person in hospitals, increased adoption of a safe patient handling policy, increased availability of patient handling equipment, and more routine use of patient handling equipment, and lower perception of injury risk.[45] Although the Washington report provided valuable data on the legislative impact, safe patient handling law requirements vary across states and the findings may not be generalizable to other states. There are clear data gaps to understand the impact of California's safe patient handling law and regulations.

Study Purpose

The purpose of this study was to explore the impact of California's safe patient handling law and regulation on MSD and PHI prevention among healthcare workers in California using both quantitative and qualitative approaches. This study analyzed California workers' compensation (WC) claims data to investigate changes in MSD and PHI claims and associated costs in 2007-2016 among California healthcare workers. This study also conducted focus groups to understand the perceptions and experiences of nurses and patient care staff regarding the safe patient handling law, policies, programs, and practices. The study had the following specific aims.

Aim 1. Describe the magnitude, distributions, and incidence rates of WC claims among California healthcare workers in 2007–2016 (total and by year):

a. Claims by injury type: MSD (PHI and non-PHI) and non-MSD
b. Claims by setting: hospital, nursing and residential care facilities, and other
c. Claims by occupation: nursing workers
d. Claims by body part and nature of injury
e. Claims by demographics

Aim 2. Examine changes of claim numbers and incidence rates of MSD and PHI claims over time in 2007–2016. Compare the data between MSD and non-MSD cases, between PHI and non-PHI cases, and between hospital and non-hospital cases.

a. Pre- vs. post-legislation periods (2007-2011 vs. 2012-2016)
b. Pre-legislation vs. post-Cal/OSHA regulation periods (2007-2011 vs. 2015-2016)
c. Change over a 6-year period (2011-2016)

Aim 3. Describe the cost of MSD and PHI claims among California healthcare workers.

Aim 4. Describe perceptions and experiences of nurses and patient care staff regarding the safe patient handling law, policies and programs in their hospitals, and their impact on patient handling practices.

Conceptual Framework

Figure 1. Conceptual Framework

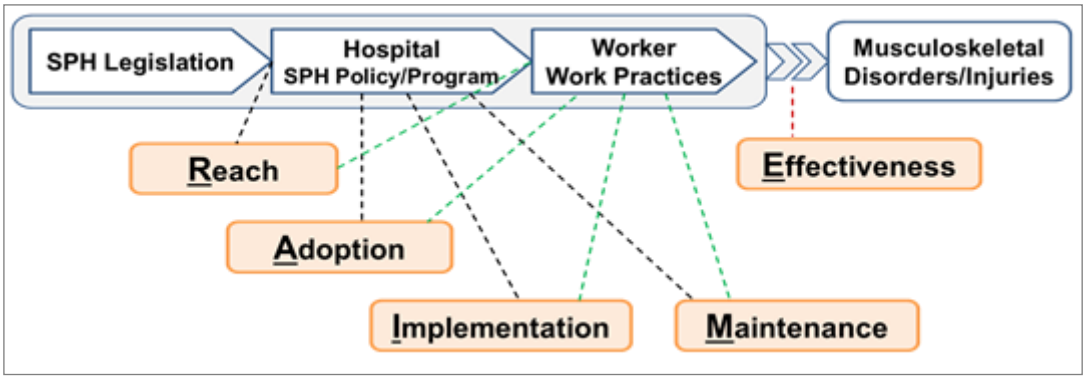


Figure 1 shows the conceptual framework of this study. The study was based on the RE-AIM framework that provides a useful guide for evaluating the impact of public health interventions.[46] The framework guides to evaluate interventions in the following five dimensions: Reach, Efficacy/Effectiveness, Adoption, Implementation, and Maintenance. In the study, the five dimensions apply to both organizations and individuals. Reach refers to the characteristics of hospitals or workers that are affected by the safe patient handling law, policies or programs. Effectiveness refers to positive outcomes or improvement in targeted safety or health indicators. Adoption refers to adoption of required policies, programs and practices by hospitals and workers. Implementation refers to the extent to which the safe patient handling programs are implemented and safety practices are performed and complied. Maintenance refers to the extent to which the safe patient handling program and practices are sustained over time. Reach, Adoption, Implementation, and Maintenance dimensions were assessed qualitatively by the focus group study of nurses and patient care workers. Effectiveness was assessed quantitatively by analyzing the WC data.

This study was conducted after receiving the approvals of the Institutional Review Boards in the University of California, San Francisco (UCSF) and the California State Committee for the Protection of Human Subjects (CPHS).

A. ANALYSIS OF CALIFORNIA WORKERS' COMPENSATION CLAIMS DATA

METHODS

Study Design

This study was a retrospective, descriptive study with a time-series design and analyzed the WC claims data for healthcare workers from 2007 to 2016 (10-year period) to assess the impact of California's safe patient handling legislation. The year of cases was based on the date of injury of the claim. Data from 2007 to 2011 were claims on injuries that occurred in the pre-legislation period; data from 2012 to 2016 were claims on injuries that occurred in the post-legislation period. Cases during the post-legislation period were further divided into injury claims in the pre-Cal/OSHA regulation period (2012-2014) and the post-Cal/OSHA regulation period (2015-2016). As the California safe patient handling law applies to general acute care hospitals only, this study used cases in other settings as comparison groups.

Data Sources

This study used claims data from the Workers' Compensation Information System (WCIS) in the California Department of Industrial Relations (DIR). This study also referred to the healthcare facility data from the Office of Statewide Health Planning and Development (OSHPD). For denominators for rate calculation, the Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) was used.

California WCIS

In California, occupational injury or illness that results in lost time beyond the date of the incident or that requires medical treatment beyond first aid must be reported by workers compensation insurance carriers to the California DIR.[47] The WCIS collects claims data on employee, employer, industry, occupation, accident, injury, progress, benefits, and payments using an electronic data interchange system.[48] Claim administrators—insurers, self-insured self-administered employers, or third-party administrators—are required to submit First and Subsequent Reports of Injury (FROI/SROI), medical bill/payment records, and annual summary of benefits. It should be noted that WCIS covers only state employers and does not collect information from federal employers (e.g., Veterans Affairs healthcare system). Electronic submission of injury reports (FROI/SROI) has been required since 2000 and electronic reporting of medical billing data has been required since September 2006.[48] We obtained FROI, SROI, and medical billing data from 2007 (when injury reports and medical billing data both became available) through 2016 from the Division of Workers' Compensation (DWC). For the data access, a Memorandum of Understanding (MOU) was established between the DWC and the UCSF. The DWC extracted data for healthcare worker cases using a broad definition (described later) from the WCIS system and delivered the data through a secure FTP site. This study used the following data elements: date of injury, nature of injury, cause of injury, part of body injured, accident description, date of birth, date of hire, gender, occupation description, employer name, employer zip code, injury site zip code, class code, industry code, total amount paid per bill, and total charge per bill.

California OSHPD

The OSHPD collects statewide data about healthcare infrastructure, workforce, and outcomes.[49] The data are publicly available (http://www.oshpd.ca.gov/HID/DataFlow/). We utilized the OSHPD healthcare facility listing information to verify the type of healthcare facility (i.e., hospital, long-term care, or clinic) or to identify zip codes of healthcare facilities for case identification.

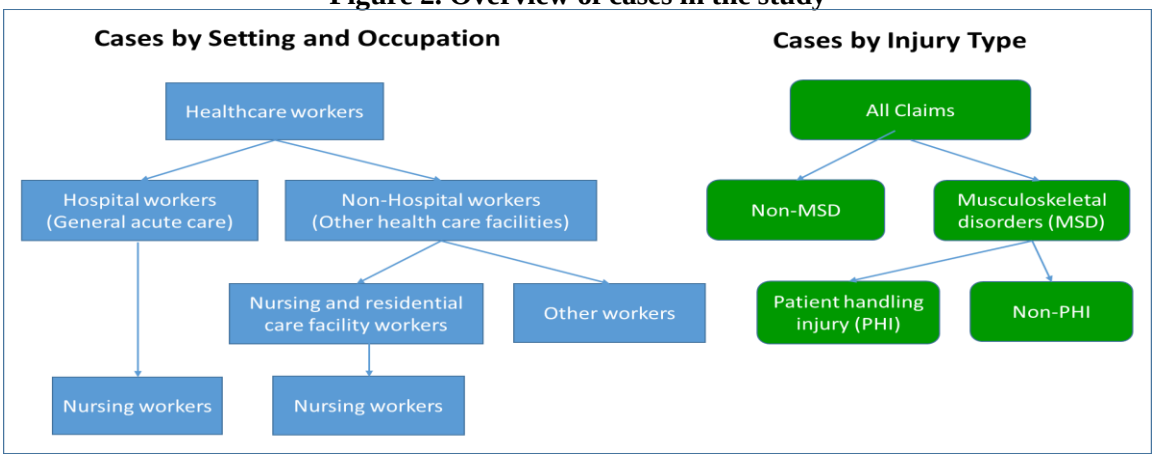
BLS QCEW

The BLS QCEW program provides monthly employment and quarterly wage information by industry at national, state, and county levels.[50] Employers reporting to the QCEW program cover 98% of all jobs in the US. Excluded are members of the armed forces, the self-employed, proprietors, domestic workers, unpaid family workers, and railroad workers covered by the railroad unemployment insurance system.[50] QCEW data are publicly available at http://www.bls.gov/cew/data.htm. QCEW provides the annual average of employment counts by industry. We used California data from the QCEW to obtain denominators to calculate incidence rates of claims.

Case Definitions and Identification

Figure 2 presents the overview of cases used in this study.

Figure 2. Overview of cases in the study



Healthcare Worker Cases

Healthcare workers were defined as those who were employed in the healthcare industry. Our case definition included various types of workers in healthcare industry or facilities, regardless of their job titles, and contractors and trainees were also included. WCIS has two data elements related to industry: Industry Code and Class Code. For Industry Codes, WCIS uses the Standard Industrial Classification (SIC) and the North American Industry Classification System (NAICS); claims administrators are asked to report the primary nature of employer's business by either code.[48] Class Codes are California-specific 4-digit codes from the Workers' Compensation Insurance Rating Bureau (WCIRB) of California. The codes represent the nature of the employer's business or type of job.[48] NAICS and SIC codes for healthcare industry and WCIS Class Codes that can be used to identify healthcare worker cases are listed in Table 1.

Table 1. Industry Codes and WCIS Class Codes for healthcare worker case identification

Industry Code (NAICS)		Industry Code (SIC)		Class Code	
621	Ambulatory health care services	80	Health services	7332	Ambulance service
6211	Offices of physicians	801	Offices and clinics of doctors of medicine	8823	Residential care facilities for children
6212	Offices of dentists				
6213	Offices of other health practitioners	802	Offices and clinics of dentists	8827	Homemaker services
6214	Outpatient care centers	803	Offices and clinics of doctors of osteopathy	8829	Nursing homes
6215	Medical and diagnostic laboratories			8830	Institutional employees
6216	Home health care services	804	Offices and clinics of other health practitioners	8831	Hospitals-veterinary
6219	Other ambulatory health care services			8834	Physicians
622	Hospitals	805	Nursing and personal care facilities	8839	Dentists
6221	General medical and surgical hospitals			8851	Congregate living facilities for the elderly
6222	Psychiatric and substance abuse hospitals	806	Hospitals		
6223	Specialty (excl. Psychiatric/substance abuse) hospitals	807	Medical and dental laboratories	8852	Home infusion therapists – all employees
623	Nursing and residential care facilities				
6231	Nursing care facilities (skilled nursing facilities)	808	Home health care services	9043	Hospitals
6232	Residential intellectual and developmental disability, mental health, and substance abuse facilities	809	Miscellaneous health and allied services, NEC	9070	Residential care facilities for the elderly – NOC
6233	Continuing care retirement communities and assisted living facilities for the elderly	8361	Residential care	9085	Residential care facilities for the developmentally disabled
6239	Other residential care facilities				

It should be noted that workers employed in federal healthcare facilities are not reported to the WCIS. In addition, in the WCIS, government healthcare facilities are generally coded as government industry (not healthcare) and thus healthcare workers employed in these facilities are not captured by Industry or Class Codes indicating healthcare. To capture all healthcare worker cases, including cases in government facilities (particularly hospitals), we developed and used a broad approach for initial case extraction using the following four search strategies:

- Healthcare Industry and Class Codes (Table 1)
- Employer Name search terms that can indicate healthcare employers (n=200: e.g., '%HOSP%', '% MED %', '%SURGERY%', '% MENTAL %', '%DENTAL%', '%CLINIC%', '%HEALTH%', '%CARE%', 'MD', 'O.D.', '%AMBULA%').
- Occupation search terms that can indicate healthcare (n=182: e.g., RN, LVN, CNA, M.D., '%MED.%', '%NURSE%', '%CARE%GIVE%', '%HEALTH%', '%PATIEN%').
- Injury description indicating patient-related injuries: 'PATIENT' or 'PT' included in the middle of the narrative; 'PATIENT' or 'PT' repeated twice in the narrative; both 'PATIENT'/'PT' and 'BED' are included in the narrative; 'PATIENT' or 'PT' included in the narrative and Cause of Injury code=74 (Struck or injured by fellow worker, patient or other person)

Using this method, the DWC extracted 959,292 potential healthcare worker cases in 2007-2016 from the WCIS. Of the cases, 44.4% (n=425,500) had both healthcare Industry and Class Codes; 13.1% (n=125,493) had only healthcare Industry Codes; 13.1% (n=125,195) had only healthcare Class Codes; and 29.5% (n=283,104) had neither healthcare codes. We reviewed employer name, occupation description, injury description, and, if needed, zip codes of employer and injury sites to determine healthcare worker cases. Based on the level of evidence, cases were classified into *definite*, *possible,* and *not likely or not* categories (Table 2). Using this method, the potential healthcare cases extracted were categorized into 621,796 (64.8%) *definite*, 151,101 (15.8%), and 186,395 (19.4%) *not likely or not* healthcare cases. Healthcare cases for data analysis included *definite and possible* case categories (n=772,897). Of the *definite* or *possible* cases, 55.1% (n=425,478) had both relevant healthcare Industry and Class Codes, 29.7% (n=229,795) had only one relevant code, and 15.2% (n=117,624) were identified by other approaches using employer name, occupational description, and injury description.

Table 2. Healthcare worker case categories

Category	Criteria
Definite	• Healthcare by both Industry Code and Class Code • Healthcare by either Industry Code or Class Code (not both), plus any evidence indicating healthcare worker from employer name, occupation description, or injury description
Possible	• No healthcare Industry and Class Codes, but 2 or more evidence indicating healthcare worker from employer name, occupation description, or injury description • No healthcare Industry and Class Codes, but healthcare worker by employer name (definite by the narrative) • Healthcare by either Industry Code or Class Code (not both), but no evidence for healthcare worker from employer name, occupation description, or injury description • No healthcare Industry and Class Codes, but possibly healthcare worker by employer name, occupation description, or injury description (by only one info)
Not likely/Not	• Evidence indicating non-healthcare (e.g., veterinary, pharmacy (retail), medical instrument manufacturing, police, firefighter, public health assistant/investigator)

Hospital Cases and Non-Hospital Cases

Healthcare worker cases were classified into hospital cases and non-hospital cases (nursing and residential care facility and other). In defining hospital cases, we excluded cases in general acute care hospitals within the Department of Corrections and Rehabilitation or the State Department of Developmental Services. This exclusion was based on the stipulation of exceptions to the Cal/OSHA safe patient handling regulation.[42] Depending on the strength of the evidence, reviewed cases were classified into *definite*, *possible*, and *not likely or not* categories (Table 3).

Table 3. Hospital case categories

Category	Criteria
Definite	• Hospital by both Industry Code (SIC 80 & NAICS 622) and Class Code (9043) • Hospital by employer name (definite by the narrative)
Possible	• Hospital by either Industry Code or Class Code (not both), plus employer name possibly indicating hospitals • Hospital by either Industry Code or Class Code (not both), plus either hospital or ambulatory care is possible by employer name entry • Hospital by either Industry Code or Class Code (not both), plus HCW occupation • Hospital by either Industry Code or Class Code (not both), plus any information indicating contractor by Industry/Class code or employer name • Government hospital cases identified by the combination of Industry/Class Codes, employer name, zip code, occupational description, and injury description
Not likely/Not	• State prison hospitals, developmental service facilities • Non-hospital settings

Among 772,897 healthcare cases, 36.9% (n=285,166) were identified as hospital cases, including 197,180 (25.5%) *definite* and 87,986 (11.4%) *possible* hospital cases. Among these hospital cases, less than 3% had Industry Codes or employer names indicating specialty, psychiatric, or convalescent hospitals, and at least 90% had some levels of evidence indicating general acute care hospitals: e.g., 50.3% (n=143,448) had General Medical and Surgical Hospitals Industry Codes (SIC 8062 or NAICS 6221) and 33.1% (n=94,303) had hospital codes by both Class (9043) and Industry (SIC 806 or NAICS 622) Codes along with employer names indicating

hospital cases. In the analysis, all *definite* and *possible* hospitals cases were grouped as hospital cases, and other cases were grouped as non-hospital cases.

Among non-hospital cases, nursing and residential care facility cases were identified using Class Codes (8823, 8829, 8851, 9070, 9085) and Industry Codes (SIC 805, 8361 or NAICS 623), and employer names and occupation descriptions were further reviewed for additional capture or exclusion of cases. Among 487,731 non-hospital cases, 180,739 (37.1%) cases were identified as nursing and residential care facility cases: 78,943 (43.7%) cases by both Class and Industry codes, 100,377 (55.5%) cases by either Class Codes or Industry Codes (not both), and 1,419 (0.8%) cases by review of employer name and occupation descriptions.

Nursing Worker Cases

The occupation description narrative data were used to identify nursing worker claims. In this study, nursing workers included nurses and nursing or patient care assistant occupations. Because it was not always possible to separate nurse and nursing assistant/aide titles from occupation description, we used the broad definition by combining all nursing-related workers. The examples of coding terms are presented in Table 4. Among the healthcare cases, 31.7% (n=244,755) were identified as nursing workers: 114,055 (46.7%) in hospitals, 63,972 (26.1%) in NRCFs, and 66,728 (27.3%) in other settings.

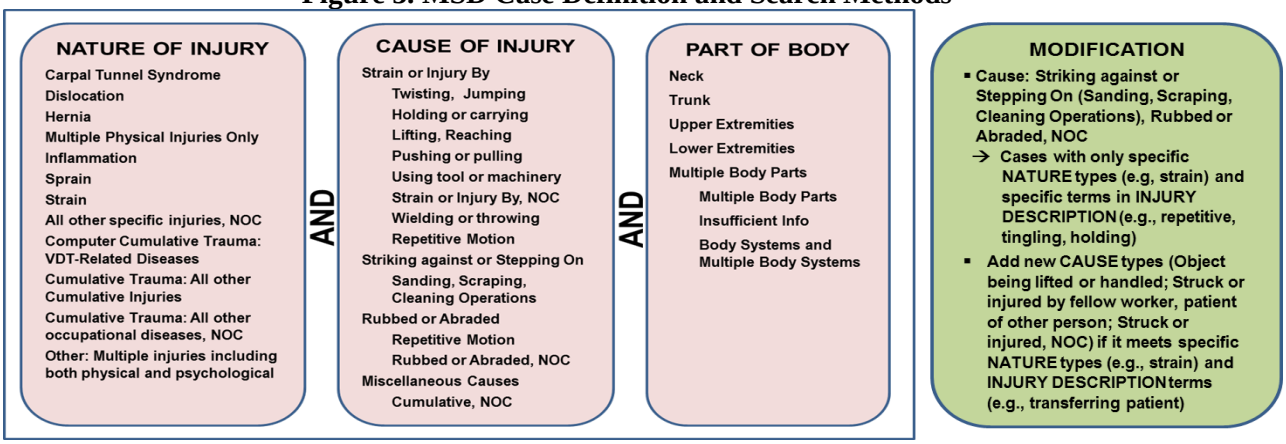
Table 4. Examples of nursing worker occupation coding terms

'RN %' 'R N %' 'R.N%' 'NP' '%LPN%' '%L.P.N%' '%L P N%' '%LVN%' '%L.V.N%' '%L V N%' '%LIC%VOC%' '%CHARGE%NU%' '%LIC%PRACT%' '%CNA%' '%C.N.A%' 'C NA' '%RNA %' '%PT%CARE%' '%PAT%CARE%' '%PCA%' '%P.C.T%' 'PAITENT CARE AS' 'LICENSED VAC%'

MSD Cases

MSDs refer to injuries or illnesses of muscles, nerves, tendons, joints, cartilage, and supporting structures of the upper and lower limbs, neck, and back that were caused, precipitated, or exacerbated by sudden exertion or prolonged exposure to physical factors such as repetition, force, vibration, or awkward posture.[51] To identify MSD cases from WC data, our case definition was based on the combination of Cause of Injury, Nature of Injury, and Part of Body Injured, and this study used a modified method of the case definition used by the California Department of Public Health (CDPH) (Figure 3).

Figure 3. MSD Case Definition and Search Methods



PHI Cases

MSD cases were classified into PHI and non-PHI cases. PHIs are injuries that occur from or during patient handling activities. Patient handling typically refers to activities of lifting, transferring, repositioning, and helping patient mobility. In addition, PHI cases in this study included injuries from patient care activities that involved moving or holding a body part or assisting a patient's body movement (e.g., dressing/bathing a patient, holding a leg during wound care, making occupied bed) and patient transporting. PHIs were identified from narrative injury descriptions. We used various combinations of specific terms or specific phrases to identify PHI cases. The examples are presented in Table 5. Injuries where patients' violent or combative behaviors were likely to be the main cause were excluded from PHI cases. The examples of violence case search terms are presented in Table 5. Because of incomplete or insufficient injury descriptions, the identification of PHI cases was likely to be underestimated.

Table 5. Examples of patient handling injury and violence search terms

Patient handling injury				
• ("PATIENT" OR "PT" OR "RESIDENT" OR "CLIENT") AND ("REPOSITION" OR "TRANSFER" OR "LIFT" OR "TRANSPORT" OR "HANDLING")				
▪ 'PULLED UP A PATIENT'				
▪ '%PUSH% BED WITH % PATIENT%'				
▪ '%TURN%PATIENT%'				
▪ '%MOVE% FROM BED TO%'				
▪ '%ASSIST% PT FROM BED%'				
▪ '%ROLL% PATIENT%'				
▪ '%HELP% TO AMBULATE%'				
▪ '%PREVENT % PATIENT FROM FALLING%'				
▪ 'PATIENT%FALL%GRAB%'				
▪ '%MAKE OCCUPIED BED%'				
▪ "HOLD" AND ("LEG" OR "ARM")				
Violence				
▪ "ASSAULT"	▪ "ANGRY"	▪ "CHOKE"	▪ "HIT"	▪ "SHOVED"
▪ "ATTACK"	▪ "AGITATE"	▪ "COMBAT"	▪ "HARASS"	▪ "STRUCK"
▪ "ALTERCATION"	▪ "BEAT"	▪ "CONFUSE"	▪ "KICK"	▪ "SLAP"
▪ "AGGRAVATE"	▪ "BITE"	▪ "CHARGED"	▪ "PUSHED"	▪ "TACKLE"
▪ "AGGRESSIVE"	▪ "BIT"	▪ "CONTAINMENT"	▪ "PUNCH"	▪ "TAKEDOWN"
▪ "ARGUMENT"	▪ "BLOW"	▪ "FIGHT"	▪ "RESIST"	▪ "VIOLEN"

Data Analysis

Data analysis was performed using the SAS 9.4 program (SAS Institute Inc., Cary, NC). Data were described with frequency, percent, mean, median, standard deviation (SD), and interquartile rage (IQR). Annual data were based on the year of injury. MSD and PHI claims were described for all healthcare worker cases and by setting (hospital, nursing and residential care facility, and other) and occupation (nursing workers). The changes of claim numbers between pre- and post-legislation periods (2007-2011 vs. 2012-2016) were described by % change (difference in the numbers between the two periods divided by the number for the pre-legislation period). MSD and PHI claim cases were also described by age at the time of injury, gender, time from hire to injury, and injury characteristics (cause of injury/activity, nature of injury, body part). Time from hire to injury was calculated as the time interval between date of hire and date of injury and categorized into 12 months or less, 13 months to 2 years, 3-4 years, 5-9 years, and 10+ years, referring to the BLS.[52]

Annual incidence rates of MSD and PHI claims were calculated for all healthcare workers, hospital workers, nursing and residential care facility workers, and nursing workers. The annual average numbers of employees in healthcare industry, hospitals, and nursing and residential care facilities from BLS QCEW were used as the denominators to calculate the annual incidence rates. For nursing workers, the incidence rates were calculated for hospital cases and nursing and residential care facility cases. As the specific numbers of nursing employees within hospitals and nursing and residential care facilities were not available, the total numbers of all employees were used as the proxy denominators to calculate rates for nursing workers in hospitals and in nursing and residential care facilities. Average annual incidence rates and percent changes between the time periods were calculated for pre- and post-legislation periods (2007-2011 vs. 2012-2016) and the post-legislation period were further divided into pre- and post-Cal/OSHA regulation periods (2012-2014 vs. 2015-2016). We modeled rates over time using a negative binomial model via SAS Proc Genmod, and the Bayesian Information Criterion (BIC) was used for the model selection.[53] We used data only from 2011 to 2016 for this analysis because we did not expect rate reductions during the pre-legislation period and including the data before 2011 might dilute the estimates of changes over time during the post-legislation period. The growth curve model was fitted to the data to compare change over time between groups. Overall F test was used to compare the growth curves between the groups. Incidence rate ratio (IRR) and 95% Confidence Intervals (CI) were calculated.

To analyze medical costs, the FROI data were merged with the medical bill data using the unique jurisdiction claim number. The data element "total amount paid per bill" from the medical bill data was used to calculate the total payment for medical bills per claim. For each claim, the total medical payment was calculated as the sum of payments for all medical bills. For the 10-year medical bill data, 46-65% of injury cases in 2007-2015 had billing records but for 2016 injury cases, only 6% had bill records. Thus, 2016 data were excluded from the medical cost analysis. We further excluded 2007 data to look at equal time periods before and after legislation (2008-2011 vs. 2012-2015). We also excluded 12 cases with negative numbers and 9,951 cases with zero for the total paid amount, and 4 cases with outliers (> $10 million) with possible errors indicated (i.e., the total paid amount was greater than the total charged amount). The 8-year total paid medical costs from 2008 to 2015 were described with sum, mean, median, maximum, and standard deviation (SD). Percentage changes over the time periods were also calculated.

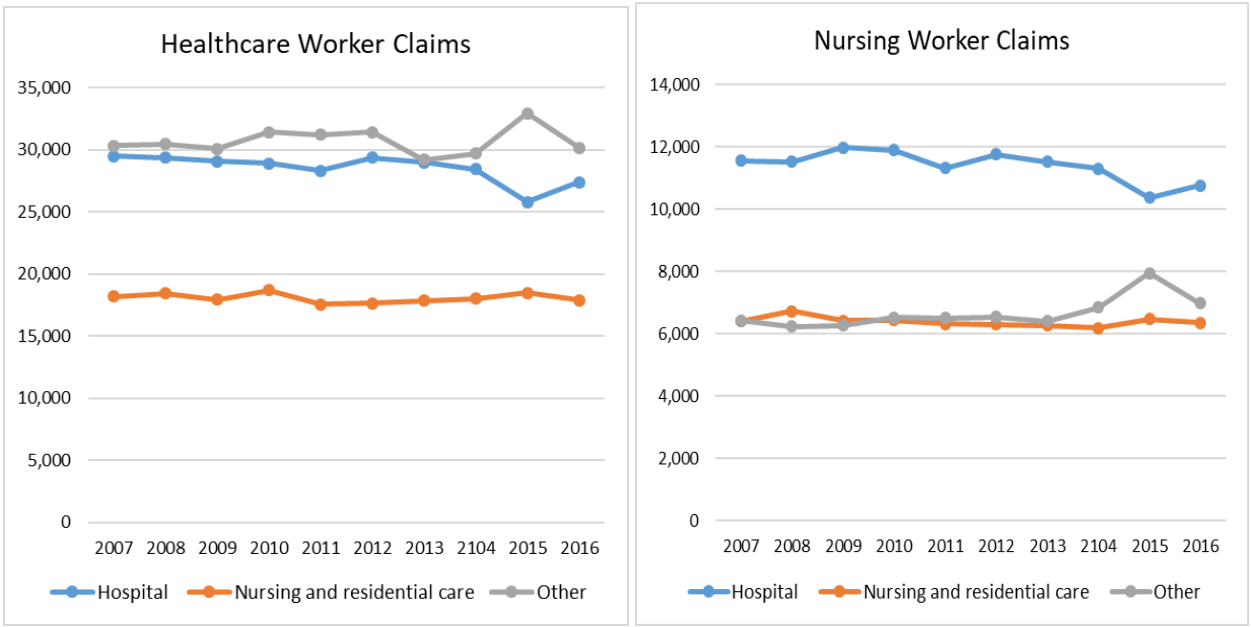
RESULTS

Healthcare Worker Claims in 2007-2016, California

In 2007-2016, there were 5,781,856 WC claims reported to the California WCIS. Among the cases, 772,897 claims (13.4%) were identified as definite or possible healthcare worker cases. Of the healthcare worker claims, 36.9% were hospital cases (n=285,166), 23.4% were nursing and residential care facility cases (n=180,739), and 39.7% were other cases (n=306,992). Among healthcare worker claims, 31.7% were identified as nursing workers (n=244,755). Of the nursing workers, 46.6% were hospital cases, 26.1% were nursing and residential care facility cases, and 27.3% were nursing cases in other settings. Annual numbers and percent distributions of healthcare worker claims by case types in 2007-2016 are provided in Table 6.

Figure 4 shows changes of the numbers of all healthcare worker claims and nursing worker claims by type of setting from 2007 to 2016. Comparing the numbers between the pre-legislation period (2007-2011) and the post-legislation period (2012-2016), hospital claims decreased by 3.53% and hospital nursing worker claims decreased by 4.40%; on the other hand, non-hospital claims in nursing and residential care facility and other settings rarely changed (-0.44%) and non-hospital nursing worker claims increased by 3.16%.

Figure 4. Workers' compensation claims among California healthcare workers, 2007-2016: All workers and nursing workers



Data Source: California Department of Industrial Relations, Workers' Compensation Information System

Table 6. Workers' compensation claims among healthcare worker cases, California, 2007-2016

Case type	Total	Year of Injury										Change: Post-Pre	% Change[e]
		Pre-Legislation (Safe Patient Handling)					Post-Legislation						
		2007	2008	2009	2010	2011	2012	2013	2104	2015	2016		
Total claims[a]	5,781,856	644,700	613,800	553,600	531,700	526,969	534,872	561,702	586,525	606,792	621,196	40,318	1.40
Healthcare worker cases[b]	772,897	78,038	78,277	77,115	79,007	77,105	78,424	76,050	76,195	77,216	75,470	-6,187	-1.59
Healthcare worker cases (%)	13.4	12.1	12.8	13.9	14.9	14.6	14.7	13.5	13.0	12.7	12.1		
Healthcare cases by setting													
Hospital[c]	285,166	29,492	29,382	29,061	28,899	28,310	29,378	29,010	28,460	25,791	27,383	-5,122	-3.53
Hospital (%)	36.9	37.8	37.5	37.7	36.6	36.7	37.5	38.2	37.4	33.4	36.3		
Nursing and residential care	180,739	18,193	18,433	17,960	18,692	17,574	17,628	17,836	18,015	18,490	17,918	-965	-1.06
Nursing and residential care (%)	23.4	23.3	23.6	23.3	23.7	22.8	22.5	23.5	23.6	24.0	23.7		
Other	306,992	30,353	30,462	30,094	31,416	31,221	31,418	29,204	29,720	32,935	30,169	-100	-0.07
Other (%)	39.7	38.9	38.9	39.0	39.8	40.5	40.1	38.4	39.0	42.7	40.0		
Nursing worker cases[d]	244,755	24,389	24,507	24,691	24,896	24,163	24,608	24,231	24,350	24,820	24,100	-537	-0.44
Hospital	114,055	11,561	11,535	11,983	11,906	11,326	11,757	11,534	11,310	10,382	10,761	-2,567	-4.40
Hospital (%)	46.6	47.4	47.1	48.5	47.8	46.9	47.8	47.6	46.5	41.8	44.7		
Nursing and residential care	63,972	6,404	6,736	6,431	6,453	6,324	6,307	6,283	6,193	6,482	6,359	-724	-2.24
Nursing and residential care (%)	26.1	26.3	27.5	26.1	25.9	26.2	25.6	25.9	25.4	26.1	26.4		
Other	66,728	6,424	6,236	6,277	6,537	6,513	6,544	6,414	6,847	7,956	6,980	2,754	8.61
Other (%)	27.3	26.3	25.5	25.4	26.3	27.0	26.6	26.5	28.1	32.1	29.0		

Data Source: California Department of Industrial Relations, Workers' Compensation Information System.

Note: Federal employees are not reported to the system. Percentage numbers may not add up to 100 due to rounding.

a. Source: California Commission on Health and Safety and Workers' Compensation annual reports. https://www.dir.ca.gov/chswc/AnnualReportpage1.html

b. Case classification is based on the level of evidence from Class Code, Industry Code (SIC or NAICS), employer name, occupational description, and injury description.

c. Cases in general acute care hospitals within the Department of Corrections and Rehabilitation or the State Department of Developmental Services were excluded; these cases were included in "Other" category.

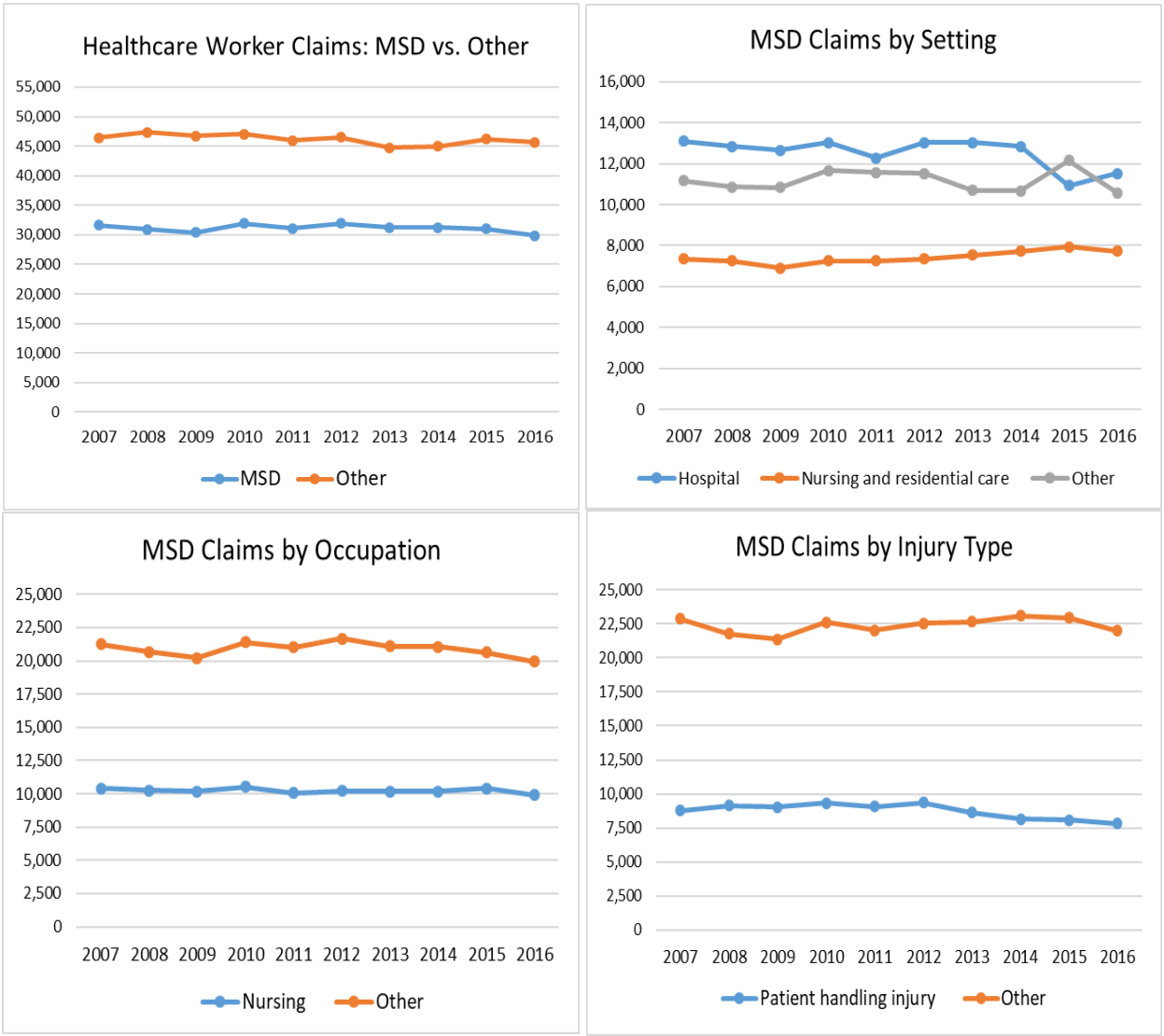
d. Nursing workers include nurse, nursing assistant, and patient care occupations.

e. Difference in the numbers between the two periods divided by the number for the pre-legislation period

MSD Claims among Healthcare Workers

In 2007-2016, 311,269 claims were identified as MSD cases; these MSD claims accounted for 40.3% of healthcare worker claims. Among MSD claims in healthcare worker cases, 40.2% were hospital cases, 23.9% were nursing and residential care facility cases, and 35.9% were other cases. Nursing workers accounted for 32.9% of MSD claims. Figure 5 shows the changes of the annual numbers of MSD claims among all healthcare workers and by setting, occupation, and injury type during 2007-2016. Detailed data are presented in Table 7. Between the pre- and the post-legislation periods, the number of MSD claims rarely changed among all healthcare workers (-0.46%), yet the annual number of MSD claims was lowest in 2016 (n=29,838). Between the two time periods, the number of non-MSD claims decreased by 2.34%.

Figure 5. Musculoskeletal Disorders (MSDs) in workers' compensation claims among California healthcare workers, 2007–2016: Claims by setting, occupation, and injury type



Data Source: California Department of Industrial Relations, Workers' Compensation Information System

Table 7. Workers' compensation claims due to musculoskeletal disorders (MSD) by setting, occupation, and injury type among healthcare workers, California, 2007-2016

Claim type	Total	Year of Injury										Change: Post-Pre	% Change[d]
		Pre-Legislation (Safe Patient Handling)					Post-Legislation						
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
Healthcare worker cases	772,897	78,038	78,277	77,115	79,007	77,105	78,424	76,050	76,195	77,216	75,470	-6,187	-1.59
MSD cases	311,269	31,625	30,926	30,411	31,934	31,095	31,905	31,279	31,236	31,020	29,838	-713	-0.46
MSD cases (%)	40.3	40.5	39.5	39.4	40.4	40.3	40.7	41.1	41.0	40.2	39.5		
Non-MSD cases	461,628	46,413	47,351	46,704	47,073	46,010	46,519	44,771	44,959	46,196	45,632	-5,474	-2.34
Non-MSD cases (%)	59.7	59.5	60.5	60.6	59.6	59.7	59.3	58.9	59.0	59.8	60.5		
MSD cases by setting													
Hospital[a]	125,237	13,103	12,828	12,656	13,024	12,277	13,019	13,033	12,843	10,932	11,522	-2,539	-3.97
Hospital (%)	40.2	41.4	41.5	41.6	40.8	39.5	40.8	41.7	41.1	35.2	38.6		
Nursing and residential care	74,310	7,351	7,247	6,913	7,252	7,253	7,361	7,548	7,729	7,929	7,727	2,278	6.32
Nursing and residential care (%)	23.9	23.2	23.4	22.7	22.7	23.3	23.1	24.1	24.7	25.6	25.9		
Other	111,722	11,171	10,851	10,842	11,658	11,565	11,525	10,698	10,664	12,159	10,589	-452	-0.81
Other (%)	35.9	35.3	35.1	35.7	36.5	37.2	36.1	34.2	34.1	39.2	35.5		
MSD cases by occupation													
Nursing cases[b]	102,271	10,389	10,239	10,182	10,516	10,077	10,229	10,195	10,161	10,391	9,892	-535	-1.04
Nursing cases (%)	32.9	32.9	33.1	33.5	32.9	32.4	32.1	32.6	32.5	33.5	33.2		
Non-Nursing cases	208,998	21,236	20,687	20,229	21,418	21,018	21,676	21,084	21,075	20,629	19,946	-178	-0.17
Non-Nursing cases (%)	67.1	67.2	66.9	66.5	67.1	67.6	67.9	67.4	67.5	66.5	66.9		
MSD cases by patient handling													
PHI[c] cases	87,348	8,757	9,138	9,046	9,310	9,066	9,359	8,631	8,147	8,066	7,828	-3,286	-7.25
PHI cases (%)	28.1	27.7	29.6	29.8	29.2	29.2	29.3	27.6	26.1	26.0	26.2		
Non-PHI cases	223,921	22,868	21,788	21,365	22,624	22,029	22,546	22,648	23,089	22,954	22,010	2,573	2.32
Non-PHI cases (%)	71.9	72.3	70.5	70.3	70.9	70.8	70.7	72.4	73.9	74.0	73.8		

Data Source: California Department of Industrial Relations, Workers' Compensation Information System.

Note: Federal employees are not reported to the system. Percentage numbers may not add up to 100 due to rounding.

a. Cases in general acute care hospitals within the Department of Corrections and Rehabilitation or the State Department of Developmental Services were excluded; these cases were included in "Other" category.

b. Nursing workers include nurse, nursing assistant, and patient care occupations.

c. PHI: Patient handing injury

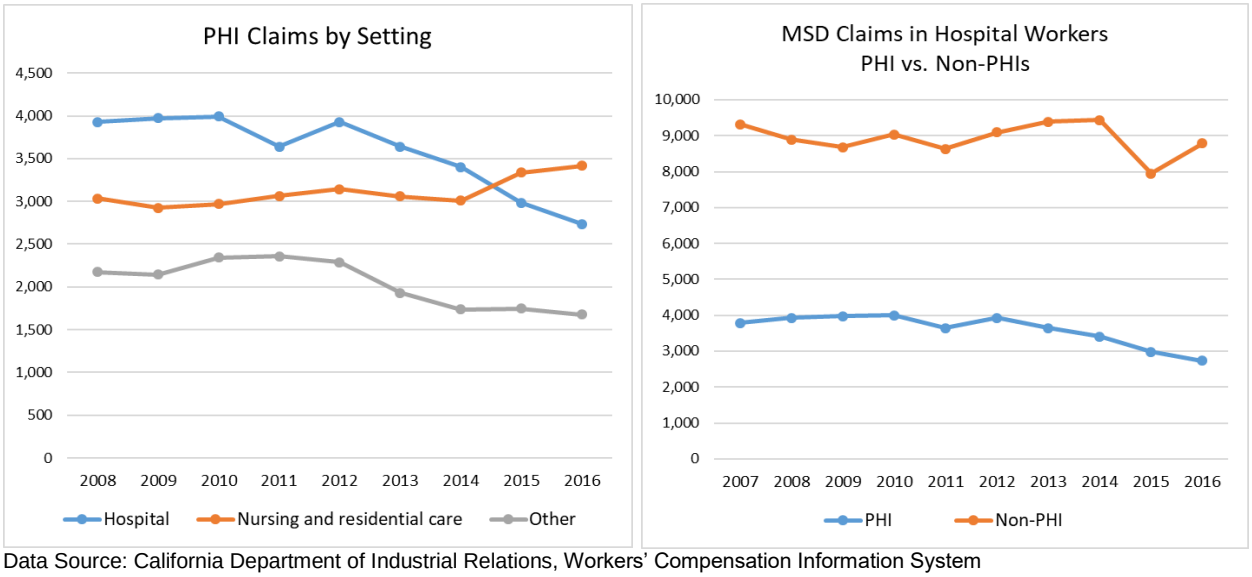
d. Difference in the numbers between the two periods divided by the number for the pre-legislation period

Looking at the change of MSD claims by setting, the number of hospital MSD claims decreased by 3.97% between the pre- and post-legislation periods, with apparent decreases in 2015-2016 (post-Cal/OSHA regulation period). Meanwhile, nursing and residential care facility claims increased by 6.33% and claims in other settings only slightly decreased with some fluctuation (-0.81%). The annual number of hospital MSD claims was highest in 2007 (n=13,103) and was lowest in 2015 (n=10,932). By occupation, the number of MSD claims among nursing workers slightly decreased by 1.04% and non-nursing claims showed little change (-0.17%) from the pre- to post-legislation periods. The annual case number of nursing was highest in 2010 (n=10,516) and lowest in 2016 (n=9,892). By injury type (patient handling), 28.1% of MSD claims were identified as PHI cases (n=87,348). The number of PHI claims decreased by 7.25%, whereas the number of non-PHI claims increased by 2.32% between the pre- and post-legislation periods. The annual number of PHI claims was highest in 2012 (n=9,359) and lowest in 2016 (n=7,828).

MSD Claims by Setting: PHI and non-PHI

Table 8 presents the numbers and percent distributions of MSD claims by patient handing and setting among healthcare workers in 2007-2016. MSD claims accounted for 43.9% of the hospital cases, 41.1% of the nursing and residential care facility cases, and 36.4% of other setting cases. Looking at PHI claims by setting, 41.2% were hospital cases, 35.2% were nursing and residential care facility cases, and 23.6% were other cases. PHI claims accounted for 28.8% of hospital MSD cases, 41.4% of MSD cases in nursing and residential care facilities, and 18.4% of MSD cases in other settings. During the post-legislation period, PHI claims in hospitals and other healthcare settings showed apparent decreasing patterns, and PHI claims decreased by 13.6% in hospitals and 16.2% in other setting claims; PHI claims increased by 7.89% in nursing and residential care facilities. Non-PHI MSD claims in hospital settings fluctuated during the post-legislation period, with little change from the pre-legislation period (+0.22%). Figure 6 shows changes of PHI claims over time by setting and PHI and non-PHI claims among hospital cases.

Figure 6. Patient handling injury (PHI) claims among California healthcare workers, 2007-2016



Data Source: California Department of Industrial Relations, Workers' Compensation Information System

Table 8. Workers' compensation claims due to musculoskeletal disorders (MSD) and patient handling injuries (PHI) by type of setting among healthcare workers, California, 2007-2016

Setting and Claim type	Total	Year of Injury										Change: Post-Pre	% Change[b]
		Pre-Legislation (Safe Patient Handling)					Post-Legislation						
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
Hospital[a]	285,166	29,492	29,382	29,061	28,899	28,310	29,378	29,010	28,460	25,791	27,383	-5,122	-3.53
MSD cases	125,237	13,103	12,828	12,656	13,024	12,277	13,019	13,033	12,843	10,932	11,522	-2,539	-3.97
MSD cases (%)	43.9	44.4	43.7	43.5	45.1	43.4	44.3	44.9	45.1	42.4	42.1		
PHI cases	36,016	3,785	3,930	3,975	3,994	3,642	3,930	3,639	3,402	2,983	2,736	-2,636	-13.64
PHI cases (%)	28.8	28.9	30.6	31.4	30.7	29.7	30.2	27.9	26.5	27.3	23.7		
Non-PHI cases	89,221	9,318	8,898	8,681	9,030	8,635	9,089	9,394	9,441	7,949	8,786	97	0.22
Non-PHI cases (%)	71.2	71.1	69.4	68.6	69.3	70.3	69.8	72.1	73.5	72.7	76.3		
Nursing and residential care	180,739	18,193	18,433	17,960	18,692	17,574	17,628	17,836	18,015	18,490	17,918	-965	-1.06
MSD cases	74,310	7,351	7,247	6,913	7,252	7,253	7,361	7,548	7,729	7,929	7,727	2,278	6.32
MSD cases (%)	41.1	40.4	39.3	38.5	38.8	41.3	41.8	42.3	42.9	42.9	43.1		
PHI cases	30,755	2,801	3,032	2,926	2,971	3,064	3,141	3,059	3,010	3,335	3,416	1,167	7.89
PHI cases (%)	41.4	38.1	41.8	42.3	41.0	42.2	42.7	40.5	38.9	42.1	44.2		
Non-PHI cases	43,555	4,550	4,215	3,987	4,281	4,189	4,220	4,489	4,719	4,594	4,311	1,111	5.24
Non-PHI cases (%)	58.6	61.9	58.2	57.7	59.0	57.8	57.3	59.5	61.1	57.9	55.8		
Other healthcare	306,992	30,353	30,462	30,094	31,416	31,221	31,418	29,204	29,720	32,935	30,169	-100	-0.07
MSD cases	111,722	11,171	10,851	10,842	11,658	11,565	11,525	10,698	10,664	12,159	10,589	-452	-0.81
MSD cases (%)	36.4	36.8	35.6	36.0	37.1	37.0	36.7	36.6	35.9	36.9	35.1		
PHI cases	20,577	2,171	2,176	2,145	2,345	2,360	2,288	1,933	1,735	1,748	1,676	-1,817	-16.23
PHI cases (%)	18.4	19.4	20.1	19.8	20.1	20.4	19.9	18.1	16.3	14.4	15.8		
Non-PHI cases	91,145	9,000	8,675	8,697	9,313	9,205	9,237	8,765	8,929	10,411	8,913	1,365	3.04
Non-PHI cases (%)	81.6	80.6	79.9	80.2	79.9	79.6	80.1	81.9	83.7	85.6	84.2		

Data Source: California Department of Industrial Relations, Workers' Compensation Information System.

Note: Federal employees are not reported to the system. Percentage numbers may not add up to 100 due to rounding.

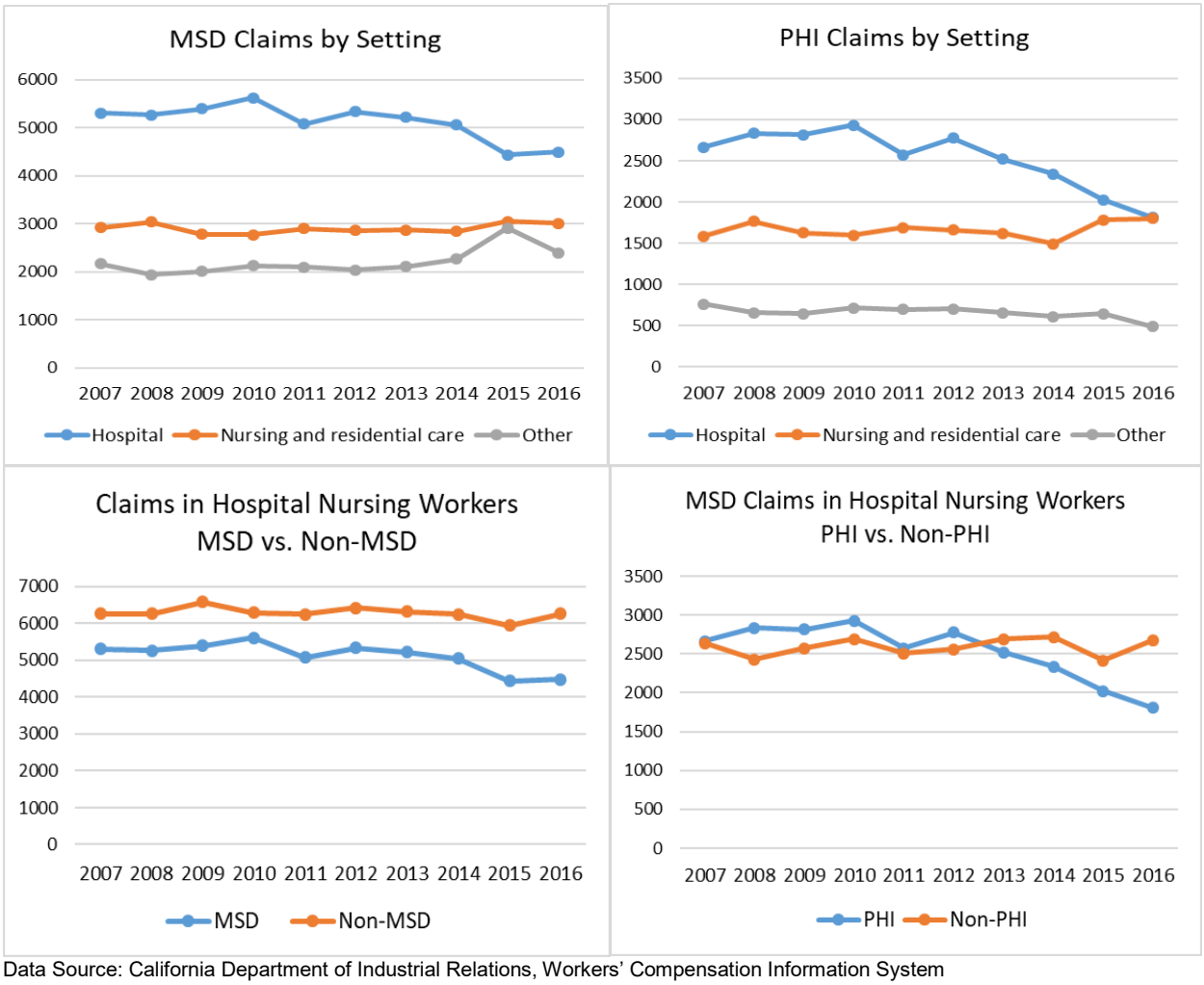
a. Cases in general acute care hospitals within the Department of Corrections and Rehabilitation or the State Department of Developmental Services were excluded; these cases were included in "Other" category.

b. Difference in the numbers between the two periods divided by the number for the pre-legislation period.

MSD and PHI Claims among Nursing Workers

Table 9 presents MSD and PHI claims by setting among nursing workers in 2007-2016; the changes over time are shown in Figure 7. MSDs accounted for 41.8% of nursing worker claims: by setting, 44.9% of hospital claims, 45.4% of nursing and residential care facility claims, and 33.3% of claims in other settings. Between the pre- and post-legislation periods, nursing workers with MSD claims decreased in hospital settings by 7.99% but increased in nursing and residential care facilities (+1.50%) and other settings (+13.4%). In 2007-2016, 48,487 nursing worker claims were identified as PHI cases, and PHIs accounted for 47.4% of MSD claims among nursing workers. By setting, PHIs accounted for 49.4% of MSD claims in hospital nursing workers, 57.2% of MSD claims in nursing and residential care facility nursing workers, and 29.8% of MSD claims in other nursing workers. The hospital nursing PHI claims showed an apparent decreasing pattern during the post-legislation period with a decrease by 17.0%. PHI claims in other settings also decreased by 10.5%; PHI claims in nursing and residential care facilities had little change from the pre-legislation period (0.99%). Figure 7 shows the changes of MSD and PHI claims among nursing workers over time by setting.

Figure 7. Musculoskeletal disorder (MSD) and patient handling injury (PHI) claims among nursing workers by setting, 2007-2016, California



Data Source: California Department of Industrial Relations, Workers' Compensation Information System

Table 9. Workers' compensation claims due to musculoskeletal disorders (MSD) and patient handling injuries (PHI) among nursing workers by type of setting, California, 2007-2016

Setting and Claim type	Total	Year of Injury										Change: Post-Pre	% Change[b]
		Pre-Legislation (Safe Patient Handling)					Post-Legislation						
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
Nursing workers, all	244,755	24,389	24,507	24,691	24,896	24,163	24,608	24,231	24,350	24,820	24,100	-537	-0.44
MSD cases	102,271	10,389	10,239	10,182	10,516	10,077	10,229	10,195	10,161	10,391	9,892	-535	-1.04
MSD cases (%)	41.8	42.6	41.8	41.2	42.2	41.7	41.6	42.1	41.7	41.9	41.1		
PHI cases	48,487	5,010	5,260	5,090	5,240	4,961	5,140	4,797	4,438	4,453	4,098	-2,635	-10.31
PHI cases (%)	47.4	48.2	51.4	50.0	49.8	49.2	50.2	47.1	43.7	42.9	41.4		
Non-PHI cases	53,784	5,379	4,979	5,092	5,276	5,116	5,089	5,398	5,723	5,938	5,794	2,100	8.13
Non-PHI cases (%)	52.6	51.8	48.6	50.0	50.2	50.8	49.8	52.9	56.3	57.1	58.6		
Hospital[a]	114,055	11,561	11,535	11,983	11,906	11,326	11,757	11,534	11,310	10,382	10,761	-2,567	-4.40
MSD cases	51,189	5,303	5,264	5,394	5,618	5,081	5,333	5,215	5,055	4,437	4,489	-2,131	-7.99
MSD cases (%)	44.9	45.9	45.6	45.0	47.2	44.9	45.4	45.2	44.7	42.7	41.7		
PHI cases	25,287	2,662	2,835	2,818	2,930	2,574	2,776	2,521	2,338	2,024	1,809	-2,351	-17.01
PHI cases (%)	49.4	50.2	53.9	52.2	52.2	50.7	52.1	48.3	46.3	45.6	40.3		
Non-PHI cases	25,902	2,641	2,429	2,576	2,688	2,507	2,557	2,694	2,717	2,413	2,680	220	1.71
Non-PHI cases (%)	50.6	49.8	46.1	47.8	47.8	49.3	47.9	51.7	53.7	54.4	59.7		
Nursing and residential care	63,972	6,404	6,736	6,431	6,453	6,324	6,307	6,283	6,193	6,482	6,359	-724	-2.24
MSD cases	29,038	2,923	3,038	2,779	2,771	2,900	2,860	2,873	2,841	3,044	3,009	216	1.50
MSD cases (%)	45.4	45.6	45.1	43.2	42.9	45.9	45.3	45.7	45.9	47.0	47.3		
PHI cases	16,624	1,588	1,768	1,628	1,596	1,691	1,659	1,621	1,491	1,783	1,799	82	0.99
PHI cases (%)	57.2	54.3	58.2	58.6	57.6	58.3	58.0	56.4	52.5	58.6	59.8		
Non-PHI cases	12,414	1,335	1,270	1,151	1,175	1,209	1,201	1,252	1,350	1,261	1,210	134	2.18
Non-PHI cases (%)	42.8	45.7	41.8	41.4	42.4	41.7	42.0	43.6	47.5	41.4	40.2		
Other	66,728	6,424	6,236	6,277	6,537	6,513	6,544	6,414	6,847	7,956	6,980	2,754	8.61
MSD cases	22,044	2,163	1,937	2,009	2,127	2,096	2,036	2,107	2,265	2,910	2,394	1,380	13.36
MSD cases (%)	33.0	33.7	31.1	32.0	32.5	32.2	31.1	32.9	33.1	36.6	34.3		
PHI cases	6,576	760	657	644	714	696	705	655	609	646	490	-366	-10.54
PHI cases (%)	29.8	35.1	33.9	32.1	33.6	33.2	34.6	31.1	26.9	22.2	20.5		
Non-PHI cases	15,468	1,403	1,280	1,365	1,413	1,400	1,331	1,452	1,656	2,264	1,904	1,746	25.45
Non-PHI cases (%)	70.2	64.9	66.1	67.9	66.4	66.8	65.4	68.9	73.1	77.8	79.5		

Data Source: California Department of Industrial Relations, Workers' Compensation Information System.

Note: Federal employees are not reported to the system. Percentage numbers may not add up to 100 due to rounding.

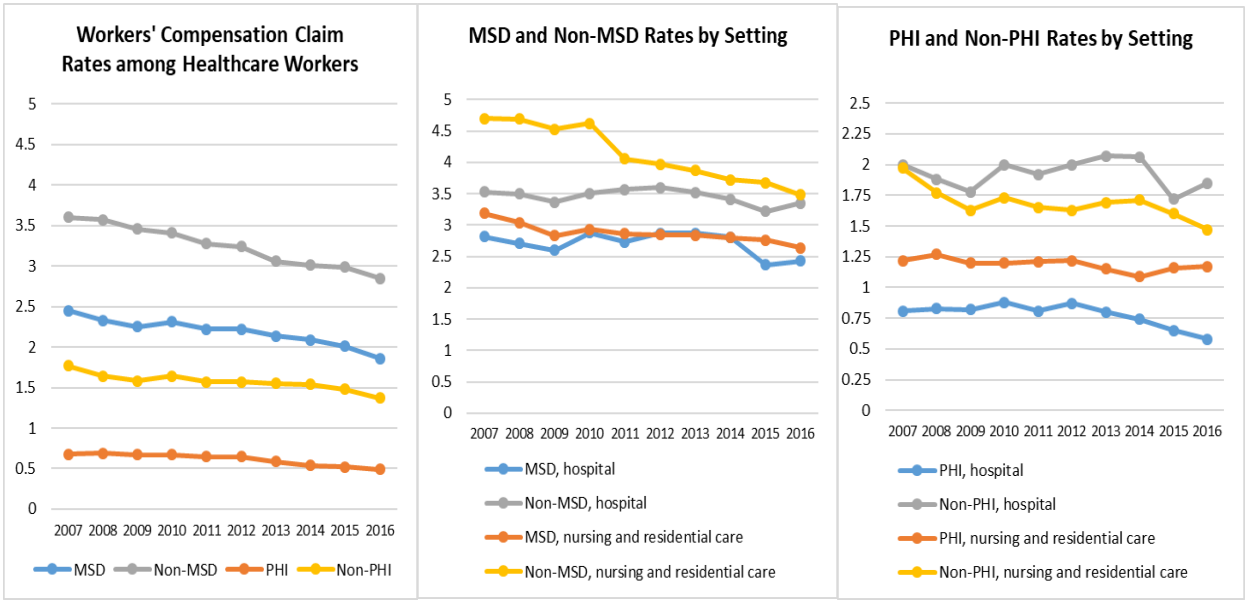
a. Cases in general acute care hospitals within the Department of Corrections and Rehabilitation or the State Department of Developmental Services were excluded; these cases were included in "Other" category.

b. Difference in the numbers between the two periods divided by the number for the pre-legislation period.

MSD and PHI Claim Rates

The trend of annual rates of WC claims among California healthcare workers by setting during 2007-2016 is shown in Figure 8. The detailed data are provided in Tables 10-11. Among all workers, the MSD claim rate was highest in 2007 with 2.45 per 100 employees and was lowest in 2016 with 1.86 per 100 employees; the rate decreased by 3.4% (IRR=0.966, 95% CI 0.958-0.975, p<0.0001) per year during 2011-2016. The 5-year average claim rate decreased by 10.8% from the pre-legislation (2.31) to the post-legislation period (2.06). The PHI claim rate was highest in 2008 with 0.69 per 100 employees and lowest in 2016 with 0.52 per 100 employees; the rate decreased by 6.0% (IRR=0.940, 95% CI 0.931-0.950) per year during 2011-2016. The 5-year average claim rate decreased by 16.4% from the pre-legislation (0.67) to the post-legislation period (0.56), more notably during the post-Cal/OSHA regulation period (-23.9%).

Figure 8. MSD and PHI claim rates (per 100 employees) among healthcare workers by setting in 2007-2016, California



Data Source: California Department of Industrial Relations, Workers' Compensation Information System

Among hospital workers, the annual MSD claim rate was highest during 2010-2013 and decreased to 2.37-2.43 per 100 employees during 2015-2016. Compared to the pre-legislation period, the 5-year average claim rate slightly decreased by 2.9% during the post-legislation period, but there was a 12.7% decrease during the post-Cal/OSHA regulation period. During 2011-2016, the MSD rate among hospital workers decreased by 3.3% per year (IRR=0.967, 95% CI 0.943-0.991, p=0.0086); the rate change tended to be greater than the changes of non-MSD rates in hospital workers (IRR=0.981, 95% CI 0.971-0.990, p<0.0001) and MSD rates in nursing and residential care facility workers (IRR=0.986, 95% CI 0.980-0.991, p<0.0001), but the differences were not statistically significant (p >0.05).

The annual PHI claim rate among hospital workers was highest in 2010 with 0.88 per 100 employees and lowest in 2016 with 0.58 per 100 employees. Between the pre- and post-legislation periods, the 5-year average PHI claim rate among hospital workers decreased by 12.0%; during 2011-2016, the PHI rate significantly decreased by 7.3% per year (IRR=0.927,

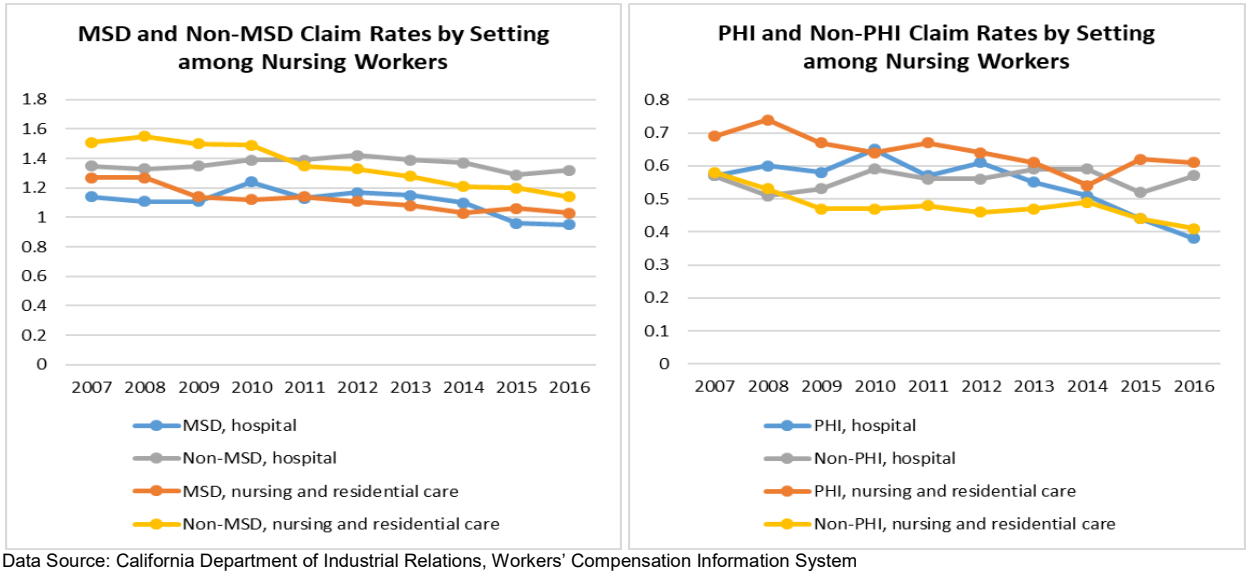
95% CI 0.903-0.952, p<0.0001); non-PHI rates fluctuated with little change (IRR=0.982, 95% CI 0.956-1.009). The trends of rate changes were significantly different between PHI and non-PHI claims (p=0.003). Moreover, the hospital PHI rate change over time was significantly different from the trend of PHI rates among nursing and residential care facility workers (p<0.0001), which had little change during 2011-2016 (IRR=0.990, 95% CI 0.976-1.005).

MSD and PHI Claim Rates among Nursing Workers

The reduction of MSD and PHI claim rates during the post-legislation period was more apparent among nursing workers (Figure 9). In hospital settings, both MSD and PHI claim rates among nursing workers were highest in 2010 and lowest in 2016. The 5-year average MSD claim rate decreased by 7.0% between the pre-legislation and post-legislation periods, particularly during the post-Cal/OSHA regulation period (16.5%). During 2011-2016, the MSD rate among hospital nursing workers decreased by 4.3% per year (IRR=0.957, 95% CI 0.938-0.977, p<0.0001). The rate reduction was significantly greater than the non-MSD rate change (p =0.011); the non-MSD rate decreased by 1.5% per year among hospital nursing workers (IRR=0.985, 95% CI 0.976-0.993, p=0.0006). Their MSD claim rate reduction was also significantly greater than the change among nursing and residential care facility nursing workers (p =0.041), which showed a 2.0% decrease per year (IRR=0.980, 95% CI 0.972-0.989, p<0.0001).

For PHI claims, the 5-year average rate decreased by 15.3% among hospital nursing workers during the post-legislation period, including a 30.5% decrease during the post-Cal/OSHA regulation period. During 2011-2016, the PHI claim rate significantly decreased by 8.5% per year (IRR=0.915, 95% CI 0.889-0.942, p<0.0001). On the other hand, no significant changes over time were found in non-PHI claim rates among hospital nursing workers (IRR=0.996, 95% CI 0.976-1.016) and PHI claim rates among nursing and residential care facility nursing workers (IRR=0.983, 95% CI 0.957-1.009, p<0.0001). Both trends were significantly different from the trend of PHI claim rates among hospital nursing workers (p<0.0001 and p=0.0003, respectively).

Figure 9. MSD and PHI claim rates (per 100 employees) among nursing workers by setting, 2007-2016, California



Data Source: California Department of Industrial Relations, Workers' Compensation Information System

Table 10. Musculoskeletal disorder (MSD) and patient handling injury (PHI) claim cases and rates (per 100 employees) among healthcare workers by type of setting in 2007-2016, California

	Year of Injury										Rate change per year, 2011-2016		
	Pre-Legislation (Safe Patient Handling)					Post-Legislation							
Case Type	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**IRR**	**95% CI**	
Employment[a]													
Healthcare, all	1,289,541	1,326,603	1,350,617	1,381,878	1,402,366	1,437,027	1,464,511	1,494,903	1,546,705	1,602,051			
Hospital	464,784	473,026	487,136	452,240	449,606	453,960	454,521	457,470	462,123	473,711			
Nursing and residence care	230,490	238,619	243,898	247,507	254,002	258,379	265,759	276,282	287,186	292,598			
Healthcare cases													
MSD cases	31,625	30,926	30,411	31,934	31,095	31,905	31,279	31,236	31,020	29,838			
PHI cases	8,757	9,138	9,046	9,310	9,066	9,359	8,631	8,147	8,066	7,828			
Non PHI cases	22,868	21,788	21,365	22,624	22,029	22,546	22,648	23,089	22,954	22,010			
Non-MSD cases	46,413	47,351	46,704	47,073	46,010	46,519	44,771	44,959	46,196	45,632			
MSD rate	2.45	2.33	2.25	2.31	2.22	2.22	2.14	2.09	2.01	1.86	0.966	0.958	0.975
PHI rate	0.68	0.69	0.67	0.67	0.65	0.65	0.59	0.54	0.52	0.49	0.940	0.931	0.950
Non PHI rate	1.77	1.64	1.58	1.64	1.57	1.57	1.55	1.54	1.48	1.37	0.976	0.966	0.987
Non-MSD rate	3.60	3.57	3.46	3.41	3.28	3.24	3.06	3.01	2.99	2.85	0.973	0.968	0.978
Hospital cases[b]													
MSD cases	13,103	12,828	12,656	13,024	12,277	13,019	13,033	12,843	10,932	11,522			
PHI cases	3,785	3,930	3,975	3,994	3,642	3,930	3,639	3,402	2,983	2,736			
Non PHI cases	9,318	8,898	8,681	9,030	8,635	9,089	9,394	9,441	7,949	8,786			
Non-MSD cases	16,389	16,554	16,405	15,875	16,033	16,359	15,977	15,617	14,859	15,861			
MSD rate	2.82	2.71	2.60	2.88	2.73	2.87	2.87	2.81	2.37	2.43	0.967	0.943	0.991
PHI rate	0.81	0.83	0.82	0.88	0.81	0.87	0.80	0.74	0.65	0.58	0.927	0.903	0.952
Non PHI rate	2.00	1.88	1.78	2.00	1.92	2.00	2.07	2.06	1.72	1.85	0.982	0.956	1.009
Non-MSD rate	3.53	3.50	3.37	3.51	3.57	3.60	3.52	3.41	3.22	3.35	0.981	0.971	0.990
Nursing and residence care													
MSD cases	7,351	7,247	6,913	7,252	7,253	7,361	7,548	7,729	7,929	7,727			
PHI cases	2,801	3,032	2,926	2,971	3,064	3,141	3,059	3,010	3,335	3,416			
Non PHI cases	4,550	4,215	3,987	4,281	4,189	4,220	4,489	4,719	4,594	4,311			
Non-MSD cases	10,842	11,186	11,047	11,440	10,321	10,267	10,288	10,286	10,561	10,191			
MSD rate	3.19	3.04	2.83	2.93	2.86	2.85	2.84	2.80	2.76	2.64	0.986	0.980	0.991
PHI rate	1.22	1.27	1.20	1.20	1.21	1.22	1.15	1.09	1.16	1.17	0.990	0.976	1.005
Non PHI rate	1.97	1.77	1.63	1.73	1.65	1.63	1.69	1.71	1.60	1.47	0.983	0.965	1.001
Non-MSD rate	4.70	4.69	4.53	4.62	4.06	3.97	3.87	3.72	3.68	3.48	0.971	0.966	0.975

Table 10. Musculoskeletal disorder (MSD) and patient handling injury (PHI) claim cases and rates (per 100 employees) among healthcare workers by type of setting in 2007-2016, California (cont'd)

	Year of Injury										Rate change per year, 2011-2016		
	Pre-Legislation (Safe Patient Handling)					Post-Legislation							
Case Type	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**IRR**	**95% CI**	
Hospital nursing cases[c]													
MSD cases	5,303	5,264	5,394	5,618	5,081	5,333	5,215	5,055	4,437	4,489			
PHI cases	2,662	2,835	2,818	2,930	2,574	2,776	2,521	2,338	2,024	1,809			
Non PHI cases	2,641	2,429	2,576	2,688	2,507	2,557	2,694	2,717	2,413	2,680			
Non-MSD cases	6,258	6,271	6,589	6,288	6,245	6,424	6,319	6,255	5,945	6,272			
MSD rate	1.14	1.11	1.11	1.24	1.13	1.17	1.15	1.10	0.96	0.95	0.957	0.938	0.977
PHI rate	0.57	0.60	0.58	0.65	0.57	0.61	0.55	0.51	0.44	0.38	0.915	0.889	0.942
Non PHI rate	0.57	0.51	0.53	0.59	0.56	0.56	0.59	0.59	0.52	0.57	0.996	0.976	1.016
Non-MSD rate	1.35	1.33	1.35	1.39	1.39	1.42	1.39	1.37	1.29	1.32	0.985	0.976	0.993
Nursing and residence care facility nursing cases[d]													
MSD cases	2,923	3,038	2,779	2,771	2,900	2,860	2,873	2,841	3,044	3,009			
PHI cases	1,588	1,768	1,628	1,596	1,691	1,659	1,621	1,491	1,783	1,799			
Non PHI cases	1,335	1,270	1,151	1,175	1,209	1,201	1,252	1,350	1,261	1,210			
Non-MSD cases	3,481	3,698	3,652	3,682	3,424	3,447	3,410	3,352	3,438	3,350			
MSD rate	1.27	1.27	1.14	1.12	1.14	1.11	1.08	1.03	1.06	1.03	0.980	0.972	0.989
PHI rate	0.69	0.74	0.67	0.64	0.67	0.64	0.61	0.54	0.62	0.61	0.983	0.957	1.009
Non PHI rate	0.58	0.53	0.47	0.47	0.48	0.46	0.47	0.49	0.44	0.41	0.976	0.959	0.995
Non-MSD rate	1.51	1.55	1.50	1.49	1.35	1.33	1.28	1.21	1.20	1.14	0.966	0.959	0.974

Data Source: California Department of Industrial Relations, Workers' Compensation Information System. Note: Federal employees are not reported to the system.

a. Employment in private sector and state and local governments. Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

b. Cases in general acute care hospitals within the Department of Corrections and Rehabilitation or the State Department of Developmental Services were excluded.

c. For rate calculation, hospital employment, including nursing and other employees, was used as the proxy denominator.

d. For rate calculation, nursing and residential care facility employment, including nursing and other employees, was used as the proxy denominator.

Table 11. Percent change of the average rates of musculoskeletal disorder (MSD) and patient handling injury (PHI) claims among California healthcare workers, 2007-2016: Pre- vs. post-safe patient handling legislation and regulation

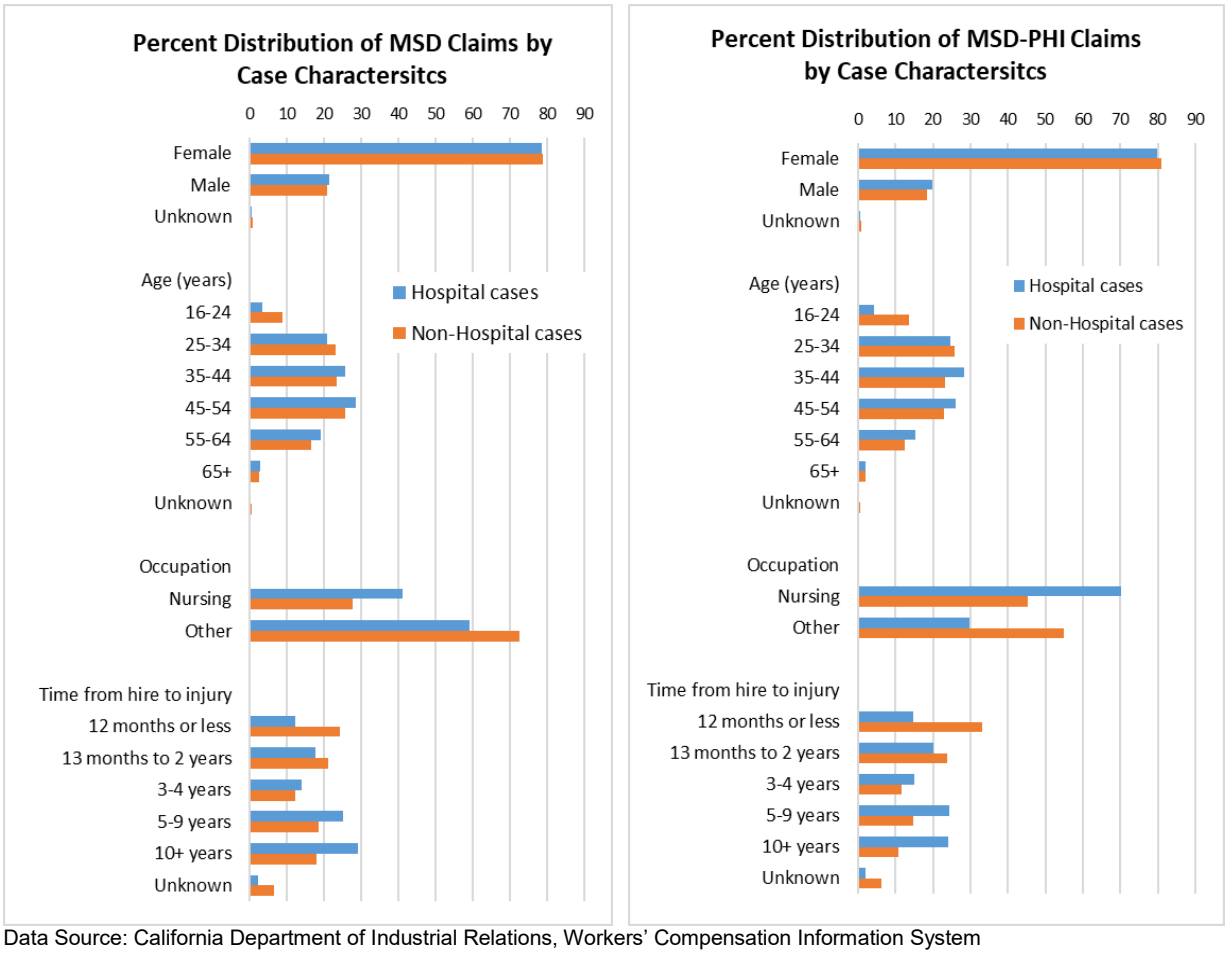
	Average Claim Rate (per 100 employees)						
	Pre-legislation 2007-2011	Post-legislation 2012-2016	% Change from 2007-2011	Pre-Cal/OSHA regulation 2012-2014	% Change from 2007-2011	Post-Cal/OSHA regulation 2015-2016	% Change from 2007-2011
All healthcare worker cases[a]							
All claims	5.78	5.09	-11.9	5.25	-9.2	4.85	-16.1
MSD claims	2.31	2.06	-10.8	2.15	-6.9	1.94	-16.0
PHI claims	0.67	0.56	-16.4	0.59	-11.9	0.51	-23.9
Non-PHI claims	1.64	1.50	-8.5	1.55	-5.5	1.43	-12.8
Non-MSD claims	3.46	3.03	-12.4	3.10	-10.4	2.92	-15.6
Hospital cases[b]							
All claims	6.24	6.09	-2.4	6.36	1.9	5.68	-9.0
MSD claims	2.75	2.67	-2.9	2.85	3.6	2.40	-12.7
PHI claims	0.83	0.73	-12.0	0.80	-3.6	0.62	-25.3
Non-PHI claims	1.92	1.94	+1.0	2.04	+6.3	1.79	-6.8
Non-MSD claims	3.50	3.42	-2.3	3.51	+0.3	3.29	-6.0
Nursing and residence care (NRCF)							
All claims	7.49	6.52	-13.0	6.68	-10.8	6.28	-16.2
MSD claims	2.97	2.78	-6.4	2.83	-4.7	2.70	-9.1
PHI claims	1.22	1.16	-4.9	1.15	-5.7	1.17	-4.1
Non-PHI claims	1.75	1.62	-7.4	1.68	-4.0	1.54	-12.0
Non-MSD claims	4.52	3.74	-17.3	3.85	-14.8	3.58	-20.8
Hospital - Nursing cases							
All claims	2.51	2.42	-3.6	2.53	+0.8	2.26	-10.0
MSD claims	1.15	1.07	-7.0	1.14	-0.9	0.96	-16.5
PHI claims	0.59	0.50	-15.3	0.56	-5.1	0.41	-30.5
Non-PHI claims	0.55	0.57	+3.6	0.58	+5.5	0.55	0.0
Non-MSD claims	1.36	1.36	0.0	1.39	+2.2	1.31	-3.7
NRCF - Nursing cases							
All claims	2.67	2.30	-13.9	2.35	-12.0	2.22	-16.9
MSD claims	1.19	1.06	-10.9	1.07	-10.1	1.05	-11.8
PHI claims	0.68	0.60	-11.8	0.60	-11.8	0.62	-8.8
Non-PHI claims	0.51	0.45	-11.8	0.47	-7.8	0.43	-15.7
Non-MSD claims	1.48	1.23	-16.9	1.27	-14.2	1.17	-20.9

Data Source: California Department of Industrial Relations, Workers' Compensation Information System. Note: Federal employees are not reported to the system.

MSD and PHI Claims by Case Demographics

Figure 10 and Table 12 show the demographic characteristics of MSD and PHI claim cases among healthcare workers in 2007-2016. Of the MSD cases, 78.6% were females and 32.9% were nursing workers; the proportion of nursing workers was significantly higher among hospital cases than among non-hospital cases (40.9% vs. 27.5%, $p<0.0001$). The mean age was 43.0 years and hospital MSD cases were older than non-hospital MSD cases (Mean age 44.3 vs. 42.1, $p<0.0001$). Those age 55 and over accounted for 21.8% of hospital cases. The median time from hire to MSD claims was 4.3 years among all healthcare workers; 39.0% had the injury in less than 3 years after being hired, and the proportion was greater in cases in other settings (45.1%). The median time was significantly longer among hospital cases than among non-hospital cases (5.8 years vs. 3.2 years, $p<0.0001$). PHI claims showed similar patterns to MSD claims. Of particular note, the proportion of nursing workers was 70.2% of hospital cases. The median time from hire to PHI claims among all cases was 3.0 years (4.8 years in hospitals vs. 1.9 years in other settings, $p<0.0001$), which was shorter than MSDs, and 56.7% of cases in other settings had the injury in less than 3 years after being hired.

Figure 10. Characteristics of MSD and PHI claim cases among healthcare workers, 2007-2016, California



Data Source: California Department of Industrial Relations, Workers' Compensation Information System

Table 12. Musculoskeletal disorder (MSD) and patient handling injury (PHI) claim cases among California healthcare workers in 2007-2016: Demographic characteristics by setting

	MSD Claims						MSD-PHI Claims					
	All cases (n=311,269)		Hospital[a] (n=125,237)		Other (n=186.032)		All cases (n=87,348)		Hospital[a] (n=36,016)		Other (n=51,332)	
Variable	N	%	N	%	N	%	N	%	N	%	N	%
Gender												
Female	244,736	78.6	98,311	78.5	146,425	78.7	70,316	80.5	28,755	79.8	41,561	81.0
Male	64,996	20.9	26,549	21.2	38,447	20.7	16,560	19.0	7,137	19.8	9,423	18.4
Unknown/Invalid	1,537	0.5	377	0.3	1,160	0.6	472	0.5	124	0.4	348	0.7
Age												
16-24 years	20,573	6.6	4,198	3.4	16,375	8.8	8,379	9.6	1,468	4.1	6,911	13.5
25-34	68,524	22.0	25,929	20.7	42,595	22.9	21,963	25.1	8,833	24.5	13,130	25.6
35-44	75,513	24.3	32,035	25.6	43,478	23.4	22,082	25.3	10,187	28.3	11,895	23.2
45-54	83,499	26.8	35,618	28.4	47,881	25.7	21,073	24.1	9,332	25.9	11,741	22.9
55-64	54,220	17.4	23,791	19.0	30,429	16.4	11,908	13.6	5,487	15.2	6,421	12.5
65+	8,196	2.6	3,519	2.8	4,677	2.5	1,706	2.0	665	1.9	1,041	2.0
Unknown/Invalid	744	0.2	147	0.1	597	0.3	237	0.3	44	0.1	193	0.4
Mean, SD (years)	43.0	12.2	44.3	11.6	42.1	12.5	40.9	12.2	42.4	11.4	39.8	12.7
Occupation												
Nursing	102,271	32.9	51,189	40.9	51,082	27.5	48,487	55.5	25,287	70.2	23,200	45.2
Other	208,998	67.1	74,048	59.1	134,950	72.5	38,861	44.5	10,729	29.8	28,132	54.8
Time from hire to injury												
12 months or less	60,261	19.4	15,284	12.2	44,977	24.2	22,181	25.4	5,240	14.6	16,941	33.0
13 months to 2 years	60,943	19.6	22,122	17.7	38,821	20.9	19,410	22.2	7,227	20.1	12,183	23.7
3-4 years	40,074	12.9	17,325	13.8	22,749	12.2	11,456	13.1	5,431	15.1	6,025	11.7
5-9 years	65,415	21.0	31,293	25.0	34,122	18.3	16,363	18.7	8,803	24.4	7,560	14.7
10+ years	69,755	22.4	36,492	29.1	33,263	17.9	14,115	16.2	8,619	23.9	5,496	10.7
Unknown/Invalid	14,821	4.8	2,721	2.2	12,100	6.5	3,823	4.4	696	1.9	3,127	6.1
Median, IQR[b] (years)	4.3	1.4-9.5	5.8	2.3-11.3	3.2	1.0-8.1	3.0	1.0-7.4	4.8	1.9-9.8	1.9	0.7-5.4

Data Source: California Department of Industrial Relations, Workers' Compensation Information System.

Note: Federal employees are not reported to the system. Percentage numbers may not add up to 100 due to rounding.

a. Cases in general acute care hospitals within the Department of Corrections and Rehabilitation or the State Department of Developmental Services were excluded.

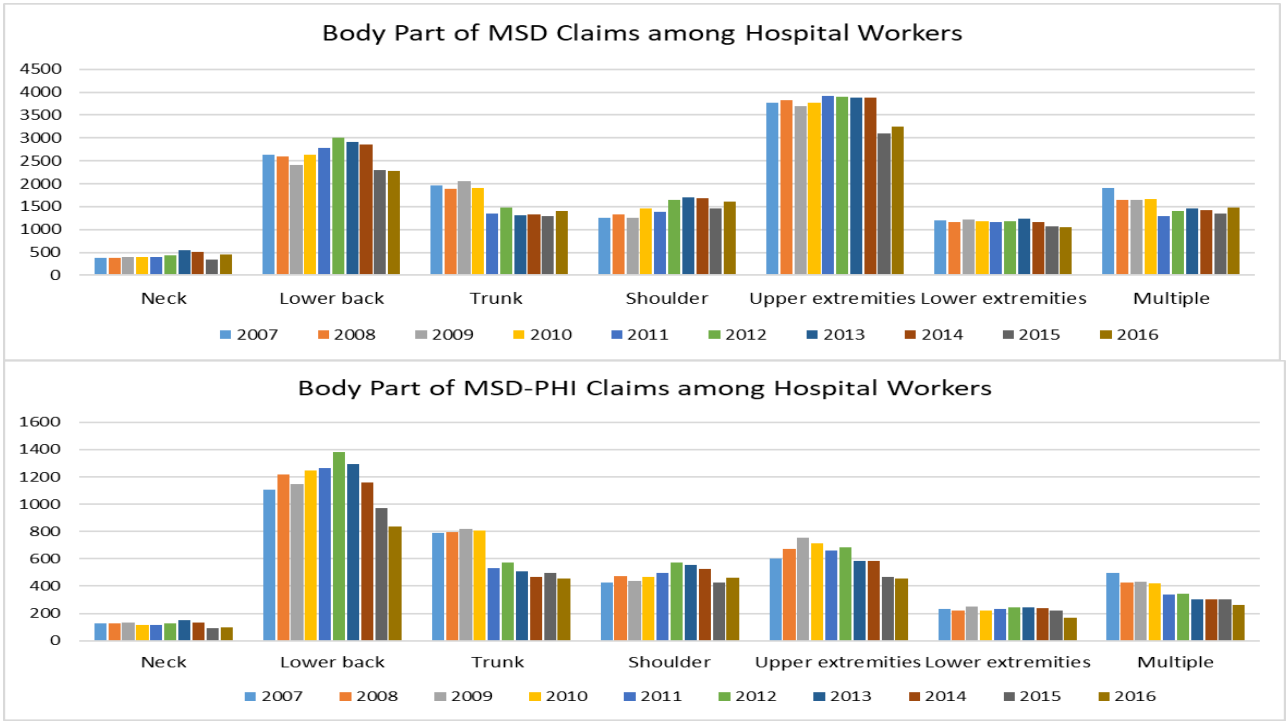
b. IQR: Interquartile range

MSD and PHI Claims by Injury Characteristics

Injury characteristics of MSD and PHI claim cases among California hospital workers in 2007-2016 are presented in Table 13. As for the part of body injured in MSD claims, upper extremity claims (29.5%) were the most common, followed by lower back (21.1%) and trunk (12.8%) claims. As for the nature of injury, strain and sprain accounted for 79.2% of MSD claims among hospital workers; 1.4% had carpal tunnel syndrome. Among PHI claims, lower back claims (32.3%) were the most common, followed by trunk (17.4%), upper extremity (17.2%) and shoulder (13.4%) claims. Strain and sprain accounted for 88.0% of PHI claims among hospital workers.

Figure 11 shows the annual numbers of MSD and PHI claims by injured body part among hospital workers in 2007-2016. During the post-legislation period, trunk claims showed the largest reductions for MSD (-25.7%) and PHI (-33.3%) cases compared to the claims in the pre-legislation period. Multiple body part and upper extremity claims showed the next largest reductions: PHI cases decreased by 28.3% in multiple body part claims and by 18.5% in upper extremity claims. As for lower back claims, PHI cases decreased by only 5.8% during the post-legislation period. This was because the annual number of claims was highest in 2012; since then it has shown apparent reductions every year. The number of claims in 2016 decreased by 39.5% from 2012. On the other hand, shoulder claims increased for MSD (21.2%) and PHI (10.3%) cases and neck claims increased by 17.1% for MSD cases during the post-legislation period. There was a significant increase in the annual rate of shoulder MSD claims over time during 2007-2016 (IRR=1.033, 95% CI 1.012-1.055). Among PHIs, strain and sprain decreased by 34.2% during the post-legislation period.

Figure 11. Part of body injured in MSD and PHI claims among hospital workers, 2007-2016, California



Data Source: California Department of Industrial Relations, Workers' Compensation Information System

Table 13. Musculoskeletal disorder (MSD) and patient handling injury (PHI) claim cases among California hospital workers in 2007-2016: Injury characteristics by year

	MSD Claims															
	All healthcare (n=311,269)		Hospital cases by year of injury (n=125,237)													
			Pre-Legislation (Safe Patient Handling)					Post-Legislation							Change:	%
Variable	N	%	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	N	%	Post-Pre	Change
Part of body injured																
Neck	11,063	3.6	380	383	390	401	397	431	539	505	352	457	4,235	3.4	333	17.1
Lower back	75,270	24.2	2,628	2,604	2,402	2,633	2,782	2,997	2,909	2,860	2,307	2,281	26,403	21.1	305	2.3
Trunk	33,869	10.9	1,968	1,882	2,055	1,906	1,345	1,479	1,304	1,325	1,297	1,402	15,963	12.8	-2,349	-25.7
Shoulder	34,589	11.1	1,251	1,331	1,257	1,452	1,393	1,642	1,699	1,690	1,465	1,604	14,784	11.8	1,416	21.2
Upper extremities	90,443	29.1	3,775	3,822	3,688	3,773	3,916	3,897	3,887	3,878	3,098	3,257	36,991	29.5	-957	-5.0
Lower extremities	29,451	9.5	1,202	1,164	1,223	1,189	1,158	1,174	1,230	1,171	1,067	1,044	11,622	9.3	-250	-4.2
Multiple	36,584	11.8	1,899	1,642	1,641	1,670	1,286	1,399	1,465	1,414	1,346	1,477	15,239	12.2	-1,037	-12.7
Nature of injury																
Strain	198,820	63.9	8,093	7,824	8,738	8,740	7,616	7,900	7,907	7,905	6,854	7,390	78,967	63.1	-3,055	-7.4
Sprain	46,985	15.1	2,439	2,491	1,750	1,921	1,960	1,998	2,166	2,143	1,725	1,555	20,148	16.1	-974	-9.2
Inflammation	7,928	2.6	356	303	250	239	230	263	278	257	132	182	2,490	2.0	-266	-19.3
Carpal tunnel syndrome	5,467	1.8	190	190	165	181	204	176	205	202	114	135	1,762	1.4	-98	-10.5
Multiple physical injuries	4,434	1.4	84	99	124	221	219	254	277	234	242	220	1,974	1.6	480	64.3
Dislocation	1,028	0.3	35	23	40	29	40	31	33	35	28	21	315	0.3	-19	-11.4
Hernia	1,023	0.3	47	32	49	29	47	39	37	36	24	28	368	0.3	-40	-19.6
Other	45,584	14.6	1,859	1,866	1,540	1,664	1,961	2,358	2,130	2,031	1,813	1,991	19,213	15.3	1,433	16.1

	MSD-PHI Claims															
	All healthcare (n=87,348)		Hospital cases by year of injury (n=36,016)													
			Pre-Legislation (Safe Patient Handling)					Post-Legislation							Change:	%
Variable	N	%	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	N	%	Post-Pre	Change
Part of body injured																
Neck	2,589	3.0	127	128	132	115	117	127	153	133	93	98	1,223	3.4	-15	-2.4
Lower back	32,156	36.8	1,107	1,217	1,146	1,246	1,265	1,382	1,291	1,156	972	836	11,618	32.3	-344	-5.8
Trunk	12,993	14.9	792	798	821	810	529	575	507	465	497	458	6,252	17.4	-1,248	-33.3
Shoulder	11,310	13.0	425	471	440	467	498	573	555	524	426	460	4,839	13.4	237	10.3
Upper extremities	14,671	16.8	603	670	754	716	663	683	587	584	468	455	6,183	17.2	-629	-18.5
Lower extremities	5,905	6.8	232	221	249	219	230	244	242	237	222	168	2,264	6.3	-38	-3.3
Multiple	7,724	8.8	499	425	433	421	340	346	304	303	305	261	3,637	10.1	-599	-28.3
Nature of injury																
Strain	62,617	71.7	2,509	2,556	2,903	2,862	2,430	2,676	2,487	2,272	2,019	1,935	24,649	68.4	-1,871	-14.1
Sprain	15,424	17.7	856	921	678	738	730	722	713	710	578	412	7,058	19.6	-788	-20.1
Other	15,424	17.7	856	921	678	738	730	722	713	710	578	412	7,058	19.6	-629	-18.5

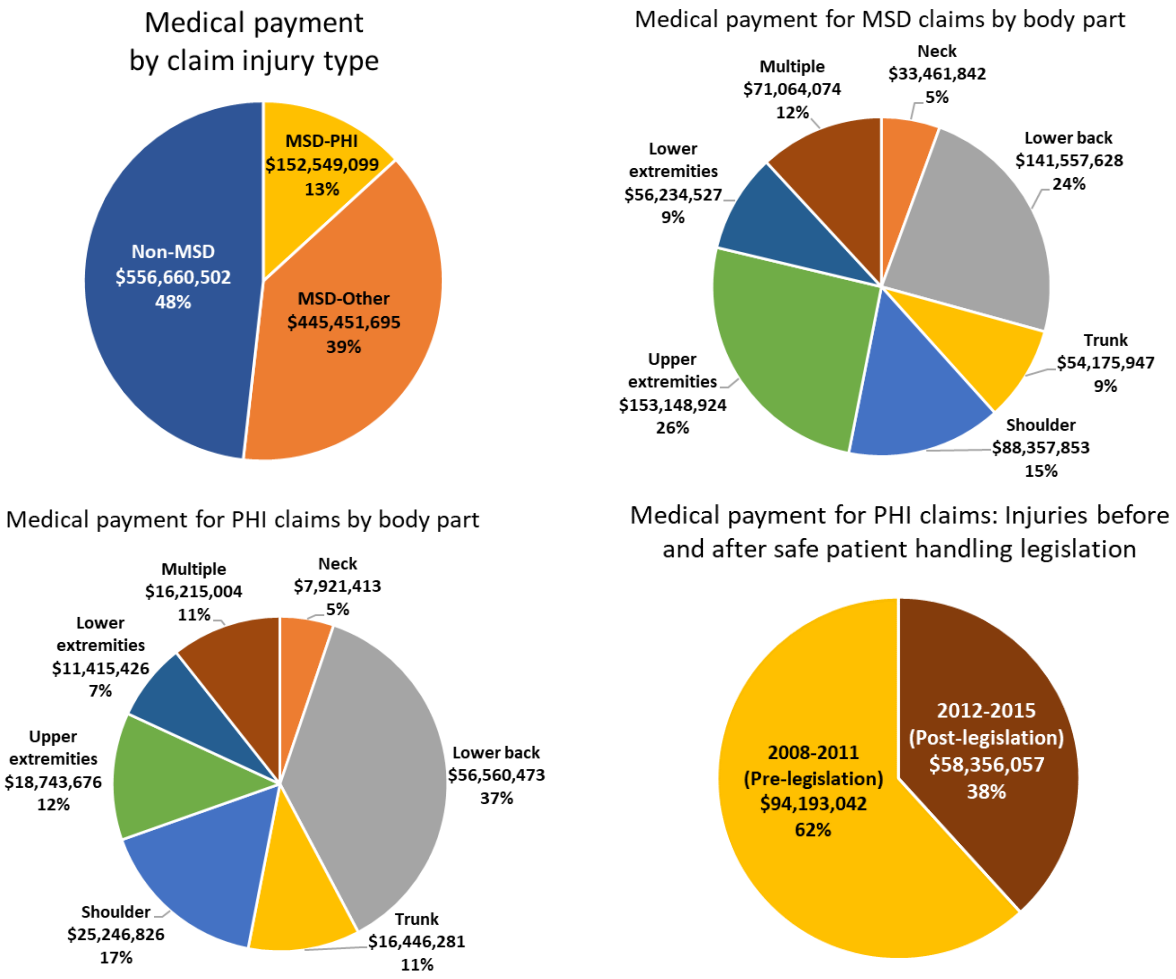
Data Source: California Department of Industrial Relations, Workers' Compensation Information System. Percentage numbers may not add up to 100 due to rounding.

Medical Costs Paid for MSD and PHI Claims by Healthcare Workers, 2008-2015

In 2008-2015, there were 619,389 healthcare worker claims; 52.1% (n=322,550) had medical billing data valid for analysis in this study. Among 249,806 MSD claims by healthcare workers, 55.2% (n=137,871) had medical billing data. Among 70,763 MSD-PHI claims, 54.0% (n=38,186) had medical billing data. The total paid costs for medical bills among the healthcare worker cases during the 8-year period are presented in Table 14. It should be noted that the year represents the year of the injury that occurred.

For healthcare worker cases with injuries during 2008-2015, $1,154 million was paid for their medical bills. Figure 12 shows medical costs by case types and injured body part. MSD cases accounted for 52% ($598 million) of the total paid medical costs. PHI cases accounted for 26% ($152 million) of the total paid medical costs for MSD cases. Looking at the injured body part for MSD claim medical costs, upper extremity claims accounted for the largest proportion of 26%, followed by lower back claims (24%) and shoulder claims (15%). For PHI claim medical costs, lower back claims accounted for the largest proportion of 37%, followed by shoulder claims (17%), upper extremity claims (12%), and trunk claims (11%).

Figure 12. Medical costs paid for healthcare worker claims, 2008-2015, California



Data Source: California Department of Industrial Relations, Workers' Compensation Information System

Table 14. Medical costs paid for workers' compensation claims among healthcare workers, 2008-2015, California: Musculoskeletal disorders (MSD) and patient handling injuries (PHI) by part of body injured before and after Safe Patient Handling legislation

	All cases	Cases with medical bill data		Total amount paid for medical bills (dollar)					Cases with injury during 2008-2011 (Pre-Legislation)		Cases with injury during 2012-2015 (Post-Legislation)		
Claim type	**N**	**N**	**%**	**Sum (a)**	**Mean**	**SD**	**Median**	**Max**	**N**	**Sum**	**N**	**Sum (b)**	**% (b/a)**
Healthcare workers													
All claims	619,389	322,550	52.1	1,154,661,296	3,580	16,809	612	2,582,611	158,652	723,752,794	163,898	430,908,502	37.3
MSD claims	249,806	137,871	55.2	598,000,794	4,337	16,683	933	1,910,799	67,006	371,962,290	70,865	226,038,504	37.8
MSD-PHI claims	70,763	38,186	54.0	152,549,099	3,995	16,966	814	1,419,084	19,055	94,193,042	19,131	58,356,057	38.3
Hospital workers													
All claims	228,291	108,993	47.7	396,148,560	3,635	16,198	607	1,419,084	54,986	253,343,645	54,007	142,804,915	36.0
MSD claims	100,612	53,437	53.1	226,406,439	4,237	17,159	860	1,419,084	26,727	143,223,875	26,710	83,182,563	36.7
MSD-PHI claims	29,495	14,856	50.4	60,695,816	4,086	21,602	760	1,419,084	7,556	37,393,697	7,300	23,302,119	38.4
Nursing workers													
All claims	196,266	94,856	48.3	321,409,713	3,388	14,788	584	1,419,084	45,474	196,515,510	49,382	124,894,203	38.9
MSD claims	81,990	43,116	52.6	173,825,849	4,032	14,840	824	1,419,084	20,579	105,248,343	22,537	68,577,506	39.5
MSD-PHI claims	39,379	20,406	51.8	77,772,086	3,811	15,804	784	1,419,084	10,170	47,061,132	10,236	30,710,955	39.5
Part of body injured													
MSD claims													
Neck	8,923	5,203	58.3	33,461,842	6,431	38,725	1,171	1,646,007	2,377	22,144,232	2,826	11,317,609	33.8
Lower back	60,535	34,152	56.4	141,557,628	4,145	16,597	807	1,018,697	16,286	90,321,850	17,866	51,235,778	36.2
Trunk	26,818	14,759	55.0	54,175,947	3,671	20,506	670	1,910,799	7,921	36,215,157	6,838	17,960,790	33.2
Shoulder	27,686	17,237	62.3	88,357,853	5,126	15,889	1,143	1,216,312	7,679	51,247,485	9,558	37,110,368	42.0
Upper extremities	72,973	39,644	54.3	153,148,924	3,863	10,844	1,050	630,332	19,340	90,948,577	20,304	62,200,347	40.6
Lower extremities	23,771	13,327	56.1	56,234,527	4,220	14,864	817	765,171	6,555	34,292,774	6,772	21,941,753	39.0
Multiple	29,100	13,549	46.6	71,064,074	5,245	14,734	1,162	334,190	6,848	46,792,214	6,701	24,271,860	34.2
MSD-PHI claims													
Neck	2,122	1,214	57.2	7,921,413	6,525	43,969	1,047	1,419,084	605	5,281,656	609	2,639,757	33.3
Lower back	26,173	14,398	55.0	56,560,473	3,928	15,023	821	662,274	7,057	35,710,249	7,341	20,850,224	36.9
Trunk	10,385	5,430	52.3	16,446,281	3,029	11,077	620	272,920	2,975	9,966,913	2,455	6,479,368	39.4
Shoulder	9,075	5,297	58.4	25,246,826	4,766	20,126	984	1,216,312	2,434	15,281,457	2,863	9,965,369	39.5
Upper extremities	11,962	6,110	51.1	18,743,676	3,068	10,154	762	474,515	3,072	10,876,992	3,038	7,866,684	42.0
Lower extremities	4,816	2,596	53.9	11,415,426	4,397	20,801	830	765,171	1,228	6,230,104	1,368	5,185,322	45.4
Multiple	6,230	3,141	50.4	16,215,004	5,162	16,034	947	305,506	1,684	10,845,671	1,457	5,369,333	33.1

Data Source: California Department of Industrial Relations, Workers' Compensation Information System. Note: Federal employees are not reported to the system.

The total paid medical costs from claims during 2008-2015 were broken down into pre-legislation (2008-2011) and post-legislation (2012-2015) periods (Table 14). For PHI claims, $58.3 million was paid for medical bills among healthcare workers during the post-legislation period; this amount accounted for 38% of the total medical costs for injuries during 2008-2015. For PHI claims among hospital workers, $23.3 million was paid for medical bills during the post-legislation period; this amount accounted for 40% of medical costs for all healthcare worker cases. For PHI claims among nursing workers, $30.7 million was paid for medical bills during the post-legislation period; this amount accounted for 53% of medical costs for all healthcare worker cases.

DISCUSSION

We examined changes in MSD and PHI WC claims among California healthcare workers during 2007-2016 to explore the impact of California's safe patient handling legislation. The safe patient handling law in California applied to only general acute care hospitals. We identified reductions in the numbers and rates of the claims among hospital workers during the post-legislation period, which may be associated with the safe patient handing legislation. MSD and PHI WC claims among hospital workers showed different patterns of changes over the time from non-MSD and non-PHI claims. We also found different patterns in the changes over the time between hospital claims and claims in other settings, particularly in nursing and residential care facilities. These findings may indicate positive effects associated with the safe patient handling law and regulation and may suggest that the law and regulation can make positive impacts for MSD and PHI prevention among healthcare workers.

Methodological Considerations and Limitations

In interpreting the study findings, our case definitions and case identification methods considering the WC data system and data quality issues should be considered. For healthcare worker cases, this study used the broad definition of claim cases involving those who were employed or working in the healthcare industry regardless of their occupation or employment types. Yet, it should be noted that our case definition had some exclusions due to the WCIS system that excluded federal employers and the scope of California's safe patient handling law that excluded certain settings. Also, as noted earlier, government healthcare cases are generally reported using government industry codes; thus, not all healthcare worker cases can be captured by class code and industry code. Additionally, there were considerable discrepancies between class and industry codes. For example, among cases with either hospital class codes or industry codes, 36% had discrepancies between the two codes and 15% had missing data for one of the two codes. We developed further sophisticated methods to search and determine healthcare cases using the information of employer name, occupation description, and injury description and classified cases based on the level of evidence. Although we conducted numerous manual data reviews for validation of our case coding programs, our findings are subject to misclassification. In addition, our PHI case identification was entirely based on the injury description record, which had incomplete or limited narratives. Therefore, the PHI case counts are likely to be underestimates. Considering this limitation of PHI case finding, we defined PHIs within MSDs and it should be noted that PHI cases in this study did not include non-MSD PHIs.
We calculated claim rates using the BLS QCEW data for denominators. The data source

provides the total employment size by industry, which consists of both full-time and part-time employees. Using this denominator data, we calculated claim rates per employees and were not able to provide rates per full-time equivalents. In addition, the BLS QCEW used NAICS codes whereas the WCIS used other codes of WCIS Class Code and SIC as well. Therefore, there can be potential mismatches between the numerators based on the three industry codes and the denominators based on NAICS only. Furthermore, we included contractors, trainees, or students in cases. For contractors, their industry code is not healthcare; therefore, the contractor population is not included in the denominator for healthcare workers. These issues could lead to overestimation. For nursing worker rates, we could not obtain the specific denominators of total nursing employment within specific settings at the state level. As the proxy, we used the total employment in hospitals as the denominator for the hospital nursing claim rate and used the total employment in nursing and residential care facilities for the rate of nursing and residential care facility nursing cases. Thus, the nursing worker claim rates per se are not accurate and substantially underestimate the true rates. On the other hand, as we calculated annual rate estimates using consistent approach within the same case category, we would not have a problem in comparing and examining the rate change over time within the same case category.

In the analysis of medical costs, we used the total amount paid for medical bills, which is different from the total charges made by medical providers. We also excluded cases with some outliers, which were believed to be errors, and with minus or zero values in the total amount paid in 2008-2015 per case. Therefore, our findings are likely to be underestimates for the true medical costs. In addition, our findings of paid medical costs by year require a special caution in interpreting the data. It should be noted that the year represents the year of injury of cases and thus the medial costs are cumulative in nature. Some chronic cases had multiple medical payments lasting over several years.

Main Findings

MSDs are well known to be the leading occupational health problem, accounting for approximately one third of lost-worktime occupational injuries and illnesses among US workers.[4] Our study found that MSD claims accounted for 40% of WC claims among healthcare workers in California in 2007-2016; the proportion was slightly higher among hospital workers (44%). About 80% of the MSD claims were strains or sprains and 51% occurred in upper extremities and lower back. Among the MSD claims, 28% were identified as PHI claims in this study, which belongs to the lower end of estimates from other studies.[18, 21] We found that during the post-legislation period, MSD and PHI claims decreased 4% and 14%, respectively, among hospital workers. In contrast, the claims increased in nursing and residential care facilities, where the safe patient handling law does not apply. The MSD and PHI claim reduction was shown to be more apparent among nursing workers, with 8% and 17% reductions, respectively, among hospital nursing workers. The reductions of annual MSD and PHI claim rates over time during 2011-2016 among hospital workers were statistically significant. For PHI claims, the rate reduction over time among hospital workers was significantly greater than the change of non-PHI claims; moreover, the rate reduction among hospital workers was significantly greater than the rate change in PHI claims among nursing and residential care facility workers. The estimated reduction of PHI claim rates was 7.3% per year among hospital workers and 8.5% per year among hospital nursing workers. In addition, the reductions of MSD

and PHI claim rates among hospital workers during the post-legislation period were shown to be larger during the post-Cal/OSHA regulation period. These findings may suggest that the reductions of PHI claims among hospital workers may be associated with the safe patient handling law and regulation, and that these law and regulation may have made a positive impact in hospital settings. However, we cannot determine a causal relationship due to the descriptive study design and methodological limitations.

Concerning injury characteristics, we found that lower back claims were the most common PHI claims; upper extremity claims were the most common among overall MSD claims in hospital workers. During the post-legislation period, we found apparent decreasing patterns in PHI claims in lower back and upper extremities each year and in trunk compared to the pre-legislation period. These findings suggest that safe patient handling programs implemented in hospitals may be beneficial in reducing the risk of injuries particularly in lower back, trunk, and upper extremities. On the other hand, interestingly, we found that MSD and PHI claims in shoulders increased during the post-legislation period, and that the annual rate of MSD claims in shoulders showed a significant increase over time from 2007 to 2016. These findings indicate a special need to evaluate ergonomic risk factors in shoulders.

In the literature, information on costs of MSDs and PHIs among healthcare workers are quite limited. Our findings provide helpful information to understand the huge economic burden from MSDs and PHIs among healthcare workers. In 2008-2015, 52% of WC claims among healthcare workers had valid medical bill data for this study. Over the 8-year period, $598 million and $152 million were paid for medical costs of MSD claims and PHI claims and these costs accounted for 52% and 13% of all healthcare worker medical costs, respectively. Of the medical costs for PHI claims, $94 million (62%) was paid for injuries occurred during the pre-legislation period (2008-2011) and $58 million (38%) was paid for injuries occurred after the post legislation period (2012-2015). This finding suggests that the safe patient handling legislation may have contributed to the reduction of WC medical costs.

B. FOCUS GROUPS

METHODS

Study Design and Sample

Focus groups were conducted using a purposive sample of nurses or patient care staff employed in hospitals. According to OSHPD,[54] as of December 31, 2015, there were 459 general acute care hospitals licensed in California; 95 hospitals (21%) were located in 10 counties in the San Francisco Bay Area (San Francisco, San Mateo, Santa Cruz, Santa Clara, Alameda, Contra Costa, Marin, Sonoma, Napa, and Solano Counties). We aimed to recruit participants from different hospitals in the San Francisco Bay Area. We distributed our study information by posting study flyers at selected hospitals in convenient locations and by distributing the flyers at nurse union training events. We also used email advertisements and word-of-mouth via various networks of unions, nursing professional associations, and nursing schools. Eligible participants were nurses or patient care workers who frequently performed patient handling duties and who had been employed for at least five years in an acute care hospital. Initially, 46 people signed up

at the on-line registration site that we created using Qualtrics. Among those, 25 people did not respond to our calls or were not able to participate due to schedule conflict or other reasons. Three focus groups were conducted in November and December 2017. According to Guest and colleagues, 3 groups are enough to identify most themes.[55] Focus groups included 21 participants recruited from 12 hospitals located in eight counties in the San Francisco Bay Area and San Joaquin Valley. Table 15 presents characteristics of 21 participants. The participants included 19 nurses and 2 patient handling specialists. The majority of participants were female staff nurses and worked in medical-surgical units or intensive care units.

Table 15. Focus group participants

Characteristic	N	%
Job title		
Staff nurse	19	90.5
Patient handling specialist	2	9.5
Gender		
Female	18	85.7
Male	3	14.3
Unit		
Medical-Surgical	8	38.1
Intensive care unit	5	23.8
Lift team	2	9.5
Neurology	1	4.8
Post-partum	1	4.8
Emergency department	1	4.8
Operating room	1	4.8
Outpatient	1	4.8
Hospital home care	1	4.8

Data Collection

We developed the focus group script to answer the following research questions:

- What are healthcare workers' knowledge and perceptions of the safe patient handling law?
- What are healthcare workers' experiences in patient handling since the safe patient handling law passed?
- What are healthcare workers' experiences on changes in safe patient handling policies and programs in their hospitals?
- What are healthcare workers' involvement in implementing the safe patient handling policies and programs?
- What are healthcare workers' perceptions about the safe patient handling program successes and challenges?
- What is needed to make patient handling tasks safer?

The focus group script was finalized with input from two nurse union representatives and one occupational health professional. The final focus group script is provided in Appendix. Focus groups consisted of 6-8 participants and were led by an expert facilitator. Informed consent was obtained from each participant before starting the focus group session. Focus group sessions

lasted for 2 hours and were digitally recorded. Study participants received a $75 gift card as a reward for their time and participation.

Data Analysis

Focus group recordings were transcribed verbatim. Qualitative content analysis was used for data analysis. Qualitative content analysis is "a research method for the subjective interpretation of the content of test data through the systematic classification process of coding and identifying themes or patterns."[56] The Dedoose software program was used for data coding. Three research team members independently reviewed transcripts and derived initial codes from the text data. Then, we organized and grouped the codes into the following nine categories: (1) knowledge and impact of the safe patient handing law, (2) hospital policies, procedures, and employee involvement, (3) training, (4) patient handling equipment, (5) lift teams, (6) staffing, (7) safety culture, (8) workload, and (9) injuries. The categories and codes served as the coding scheme for data analysis. New codes were added as needed within categories in the coding process. For credibility, at least two members coded data for each transcript, and each member presented their analysis results with identified themes to the team. We organized themes by subcategories of positive experiences and perceived challenges/concerns within each category.

RESULTS

In discussing the impact of the new safe patient handling legislation, the focus group participants described both improvements and continuing issues over the past several years since the passage of the law. Participants expressed contradictory experiences in some areas. The participants' perceptions and experiences are described by content category with positive experiences and perceived challenges or concerns.

Knowledge and Impact of the Safe Patient Handing Law

Many participants (n=14) indicated some levels of awareness of the safe patient handling law. As for positive experiences, most participants (n=16) mentioned increased equipment availability and/or increased training. Three participants indicated feeling more empowered to advocate for what they needed since the passage of the law.

> *I personally feel like that equipment has been provided to us because there's a law. I don't feel like it would've ever been done had there not been this legislation.*
>
> *I'm not very particular with my knowledge of the law, but I think the crux of it for me that I know is that they require annual competency training.*
>
> *[Legislation] has been the driver, has been the only reason that they have improved. Had that legislation and regulation never been put into place we wouldn't have what we have now.*
> *People pay more attention to safety and handling nurses having the knowledge that there is something. They may not understand and have read the whole entire law and know the language behind it, but at least the knowledge is out there that, hey wait a minute, there are*

rules, and we're supposed to be doing this a different way. That has really helped. Because the nurses now feel like they can speak to that and say, "I know there's a law about this somewhere," or "I heard that there are regulations that we're not supposed to have to do that." So that has empowered a lot of nurses. Just having equipment.

Perceived challenges were also identified. Four participants reported that they were unaware of the safe patient handling law. Unions were identified to fill the gap as a source of knowledge and education on the safe patient handling law and regulation. Five participants indicated that the safe patient handling law is not protective enough in practice and there is a general lack of change or improvement.

I didn't know about that it became a law. I don't know exactly how I was informed, but I know that the union passed a lot of information about it.

I found out about it through my union and union activity with one of the shop stewards. And I belong to SEIU, and the SEIU Alliance did a lot of lobbying around getting that law passed.

So what I'm thinking as you're talking is it looks pretty on paper. The policy is all nicely updated. There's nice handouts. There's the required on-screen computer video we do every year and there's maybe more equipment. There's definitely more education, but there's no more support to get the job done.

With the law, there was absolutely no change in the staffing. And the sort of-- how sketchy and understaffed my department is, is just reflective of sort of acknowledging the law, but actually doing nothing…

When nurses got involved and really invested in what this legislation we were hoping would do for us was…nurses not being injured… But, what I've actually seen impacted in real life is that the hospital industry, rather than valuing what it was supposed to be meant for the intent of it, they spend so much time, their time, their energy, and their resources finding ways to work around it.

Hospital Policies, Procedures, and Employee Involvement

As for positive experiences, eleven participants expressed some level of awareness of a policy on safe patient handling in their hospital. Nine participants were aware of safety committees on patient handling and one participant mentioned participation from various disciplines on the committees.

I believe that there is a safe patient handling policy. And I was when the-- during my orientation, they showed me where I can find it in online. And then if there is any question, I can just search, and then I can bring it up as a document. And… there is a safety committee, so there is a discussion every Wednesday. And they are focused on patient safety as well as employee safety, and then in terms of handling of our equipment and then patient as well.

Yeah, I've seen it [policy]… I attended a different task group last year that tasked me with comparing what the law is to what our policy is…. And when you peel back all the layers, the policy is you have to use a lift equipment.

Algorithms. That's one of the big words in our policy… I was just looking at my phone to see if I could get remote access to the general Intranet site, because you can read the policy about how to use… equipment when appropriate and the algorithms will tell you how many people you need to do this. You can say no. If you see you're in an unsafe situation, you can refuse to do it without being punished. (patient handing specialist)

… safe patient handling committee, per our union in contract. It is co-chaired by a member of management and then a member of labor… So I think that's appreciated. There is involvement of a different bunch of disciplines: PT, nursing, lift team…

When you do get injured then there's a report that goes out to the region. Each week it's the weekly injury report, and it tells you how somebody got hurt, and what they could've done different to prevent it.

Many participants (n=11) indicated perceived challenges of the perceived lack of usefulness of the policy, limited employee involvement or nursing representation in the safe patient handling committee, and the committee's lack of authority to make change.

I'm sure our hospital also have a policy. Honestly, I've never looked at it, but I really didn't check.

We have a really big committee that's corporate-wide, but it hasn't trickled down to our hospital….They have definitely not involved employees in their policy and at a local level.

We have safety committees now. The involvement is those safety committees is primarily administration, management and non-nursing staff. All of the ancillary staff departments are represented, but the focus of that "safety committee" is… with no real nursing input, they make decisions about our nursing workflow that had, first of all, no input from the actual user, the nurses.

The significant issues don't really get any traction from the committee to management.

We do have one, and it's a powerless committee…They come up with little posters like it's been X amount of days since we've had an injury. There is nothing that is constructive. I would say, that comes out of those committees.

I think the one thing that really stuck out in my mind when I read the policy is the discipline associated with it. So if a nurse is injured moving a patient then they are subject to discipline.

Training

Ten participants indicated that there was increased training since the passage of the safe patient handling law. Training had a focus on equipment use and was provided in various formats: training occurred at orientation, annually, tied to in-service, skills day and when new equipment was introduced, using computer modules, hands-on, and competency tests.

> *There is more regular training.*
>
> *So I got trained once. And then annually, we do a module on the computer, continuous education program annually, and the annual skill check. And they bring the machines. So I have to show how to use it. So they want to check the competency.*

Six participants indicated that the training received was not sufficient or effective; one participant commented that the training varied by facility, department, and shift.

> *…individual departments have control over how they use their budget, and if one decides they want to spend more resources into the health and safety of their staff and patients and train them in skills day and mobility, then you're going to see maybe more robust training.*
>
> *It depends shift by shift, because when the education rolls out for something new it seems like, day shift, they get the product rep there, they get hands-on. They have huddles. They get this massive amount of education….And nights, you get a flyer...You get a picture.*
>
> *With a lot of the equipment that was introduced you got initial training when they first were planning to bring it. But then several months, a year later when the equipment finally shows up, there's been this long gap of time between receiving the knowledge and using it. And so you don't use it, you lose it. And there's no re-education. There's not refreshers.*
>
> *…And whole departments, like our med-surge department, haven't had a training in three years. And I had the director look me straight in the face and say, "We give you that training every year." And I'm like, "I've not it for 10 years. I've never been invited or anything." I think that what makes me the most crazy about it is that the lift equipment isn't the only thing we need to be educating our people on.... We need to be taught how to take care of ourselves in ergonomics and all that. And it's a huge component. Even when you're using the lift equipment, you can so hurt your back using the lift equipment.*

Patient Handling Equipment

Many participants (n=15) expressed both positive experiences and perceived challenges regarding lifting equipment. Participants reported increased availability of lift equipment and limited increase in the use of lift equipment with continuing barriers. Nine participants mentioned certain types of equipment that are particularly helpful, such as HoverMatt and ceiling lifts.

> *There's more of a variety of equipment available. And I think there's been an improvement*

in the equipment available because of the law. But I don't necessarily think there's been a huge increase of use of equipment.

We have in-ceiling lifts now, which are great. The union advocated for them. The hospital got them. But I feel that people don't utilize them because they're slow or they're intimidated by them because they don't feel like they have enough competency or training on them.

It has been improved. And there's this additional equipment… But I think the thing that's been the most beneficial …is that HoverMatt.... Now we all have it.

Another change is I think that we have a lot of training. That's why if somebody fell on the floor and then somebody says, "Oh, let's use the machine." So we can—because as old nurses, we just do manpower. But the young ones, they say, "Oh, let's use the machine"… so a lot of change in our minds.

Perceived challenges in lift use were described as follows: using equipment is time-consuming; equipment is often not readily available when needed and is inconvenient to use and store; there is insufficient staff available to use the equipment; equipment is not always appropriate for the specific patient situation; staff lack competence in using the equipment; and there were concerns about quality of care or patient discomfort related to equipment.

It's mostly time and convenience ... If we try to use it all day long, we wouldn't be able to finish our assignments…it is a difference between 60 seconds and 15 minutes.

So if the equipment is not nearby or if there's not someone that I can grab as well as the equipment, then you're maybe going to try to do it in a way that really we shouldn't be doing.

Our rooms aren't big enough for my body to be in the room half the time let alone bringing equipment in with me…There's not room to get a lift into most of our little rooms because our hospital is old. They do provide us with the equipment but it's not practical to use it. You need that second person… That is a process that takes time and takes resources. And you often don't have either one of them.

The equipment is not always appropriate. You can't use the equipment to get somebody out of the bathroom that's fallen…. Equipment's not always the answer.

I mean there are so many little complications to using the equipment. It's intimidating.

I try to use that, but patients don't much like it.

Lift Team

Seven participants noted that they had or used to have lift teams in their hospital and described positive experiences of benefitting from designated staff to assist with patient handling, even though access was difficult at times.

I can always depend on them… to know how to use the equipment quickly. They've been a good resource for us.

We had at one time a very robust, very full lift team. They were well trained. They were available. We had designated teams for different parts of the hospital and on different shifts. It was a huge benefit for us on night shift where we had less nursing staff and that trended away.

It wasn't enough. It wasn't 24/7. But it was something. And again they were dedicated. They were very skilled at what they did.

As for perceived challenges, five participants described the limited availability of lift teams. Five participants described that lift teams in their facilities were eliminated or replaced by a buddy system where patient care staff would depend on each other for help with lifting, thereby taking staff away from their other patient care responsibilities.

I never see them [lift team] on the day shift. So I don't know where they are, how many there are, but I don't see them.

I'm on the lift team… But we're like this little island, and there's about eight of us covering the whole hospital 24/7. And none of us get replaced if we're either on vacation or call in sick. And now, we're in a bigger building that has more territory to cover in a way. So I think we get less work because people figure it's going to take us a half hour to get there, so they go ahead and wreck their backs on their own instead of letting us wreck ours for them.

On night shift particularly is just nurses. We have no ancillary staff. We used to have lift teams to aid us with patient mobility, but the teams were removed completely about five years ago and replaced with equipment, technology.

So you would be assigned at the beginning of your shift a buddy co-worker, a nurse, and depending on the proximity of your patient assignment was you would be her buddy. So when she needs helps lifting you go help her. And vice versa. Without consideration for what your individual workload was, your availability, how much more need one person had for mobility over another one. It was a system that failed us.

Staffing

In terms of staffing, no participant expressed a positive experience. Instead, understaffing was addressed as a critical issue. Sixteen participants described unchanged or decreased staffing and difficulty securing lift assistance from staff. Some felt that the focus on increasing funding for equipment led to a reduction in funding allocated to staffing. Most participants (n=15) indicated that lift equipment would not replace the need for staff.

One of my favorite expressions is bariatrics is a team sport. You need a bunch of people. Even if you've got the sling, you've still got to hold that thing when it gets to the-- when you

get them on the side, you got to have one or two people, that whole thing. (patient handling specialist)

The lack of support, either through ancillary staff, CNA's or just additional nurses with availability to help lift is very challenging.

We really need enough personnel resources. At my hospital, we only have one charge and one break nurse. And the break nurse needs to cover each nurse's break, plus they have to respond to code.

And now, the hospitals have had to spend a lot of money to do this, and they're looking at how else can we take money from here. That's how I feel, and I feel like we've seen staffing get worse and worse, and I just hope it doesn't get any worse than it is but lack of staffing, lack of resources.

I think it's just staffing primarily is quite a big issue... The money has been put into this equipment, which is great. We need it…The money, it's been taken from other places it feels like, and it feels like that has been taken from the actual physical person who can help you with things. You have this huge patient need to do a dressing change. That equipment is not going to do that dressing change for you.

We are all chronically understaffed. There is not a unit that is not chronically understaffed because there's lack of ancillary staff. The patients are sicker now than they ever have been in my 25 plus years of nursing... They've got comorbidities. They've got a lot going on. So without the additional staff to help with mobility, it impacts the total care that's delivered to the patient. And it also impacts injuries to staff.

They [lift teams] have so much workload. So how can they really cover everybody? So actually, right now, I'm not calling the lift guy at all because I understand. I'd rather ask the nurse or try to by myself. So what I think is really, hospital need to hire more people, more nurses, more lift guys for everybody.
So without the additional staff to help with mobility, it impacts the total care that's delivered to the patient. And it also impacts injuries to staff.

Safety culture

Many participants (n=11) described positive experiences and changes in safety culture, specifically an increased awareness of the importance of safe lifting on the part of staff and management, increased use of lifts, and increased appreciation of helping each other.

At least knowing that there's a requirement that we're supposed to be using equipment has at least raised our awareness and we're much better with the teamwork, I think. And much more conscientious about what we're doing and taking care of ourselves and making sure we're doing the right thing, and then putting on the breaks…and recognizing, wait a minute, I'm gonna have to say, "It's time to get the lift equipment. I'm not going to help this patient unless I get it."

I think it's the culture. Especially for the night shift. It's never had help, and traditionally people feel` like there's less staff on nights. But I think culture, I definitely think the training has been more regular and hitting-- now the night shift is aware and using it and getting people to use it if it is appropriate.

…to prevent any injury is their teamwork, enough staff. This is going to make the job a lot easier without a lot of injury. If my nurse, the one I'm coming to help her, she thinking about me not only to make that quality care for the patient only, she care about me as well anybody in the room, I'm willing to care about her too. So this is going to make that teamwork really, really easier.

Many participants (n=9) also described perceived challenges. They indicated that management did not prioritize worker safety and was punitive or 'blaming of workers' for their injuries.

So things are there because of the legislation, but the message from management and hospital management is very punitive and condescending that, "Well you wouldn't have got hurt if you would have done it my way." Hospital industry, in general, has gotten more punitive over the years.

It's a very hostile, punitive environment, that if you don't use the equipment, you get hurt. We're not going to pay for it.

I mean, they don't want to look at their own systems anymore. It used to be if there was an injury or a mistake or a med error or whatever, they would look at their system and see if there was something they could fix. Now they look at the person and want to blame the person as a general rule on everything I think.

But the fact of the matter was, again, all of these pieces that we've talked about that were missing. There was a lack of education. A lack of resources. A lack of staff. But it has a turned this corner with this new regulation, and it seems like there has to be a way to put the blame on that front-line person. That they are human, and they must've made a mistake for this injury to occur. So it's not really caring in any way that you got hurt, and that they want to do something to help you with that injury. It's you screwed up.

Workload

Many participants (n=10) expressed perceived challenges with their workload and changes in patient care although it may not be directly linked to the safe patient handling law. They described fast-paced, demanding or increased workload with insufficient staffing and concerns about overtime.

It's become more frustrating to do my job. I've been a nurse for 20 years, and I'm more and more frustrated every day at work because we're expected to do more with less every day.

Again, on a med-surge unit, it's very fast-paced. There's a lot of expectations. There's not time allowed for things you do need to do like teaching and moving patients, and so people

have to move quickly. So if equipment is not nearby or if there's not someone that I can grab as well as the equipment, then you're maybe going to try to do it a way that really we shouldn't be doing it or it doesn't get done.

I feel like patients a lot heavier than before. They have more mobilizing problem. They have knee or hip surgery. And then patients getting older.

They added so much more protocols, like the ERAS protocol. If a patient got a hip or knee surgery, they have to stand up within eight hours of surgery. So all those demand is added on the top of everything we have. I don't think any protocol was deleted. Keep adding, added, added.

They're asking more with less. Because just the point is I don't care how much money that you spent to install this big massive expensive piece of equipment in every single one of the critical care rooms when you only have one nurse per shift.

I feel like, now am I going to wait for one hour to [get a] team delivered to my room, and waiting for the second person to come here, and then save my back in my own bed that hurt or ending up overtime, and then I get coached by my manager, "You're doing overtime. You cannot do that. "So I would choose just-- okay, let's just quick do this, not get in the [trouble], and then just get on with it."

Injury Concerns

Most participants (n=15) expressed concerns regarding safety and injuries. Participants indicated that workload, inadequate staffing resulting in the lack of help, and time pressures put nurses at risk of unsafe behaviors and injuries and talked about injuries of their own or coworkers with negative perceptions about workers' compensation. Two participants raised interesting questions that injury patterns may change with more use of equipment such as an increase in cervical and shoulder injuries.

We have a lot of people on modified leave, and then I had my own back injury just recently.

A lot of times, you can't really call or wait for help. And a lot of times, nurse, including myself… just end up doing the lifting myself. And that is dangerous to myself, probably dangerous to the patient, and over time, I know that I'm probably paying for it.

There's a general understanding that they don't get [adequate] medical care if they're on Workers' Comp…. We have employees that have been injured that come limping back on the floor and tell us their nightmare stories about not being able to get an MRI, and not being able to get a cortisone shot, and not being able to get anything without pain pills.

There's more cervical and shoulder injuries now because you have to-- especially if they're heavy, bringing the ceiling lift down and trying to get the equipment over. So it's switching types of injuries, and I think that will become more apparent with time.

DISCUSSION

This focus group study was conducted with only a small number of nurses and patient handling staff recruited from only a small number of hospitals; therefore, the findings cannot be generalized to others. With this limitation, this study provides valuable information from workers' perspectives to explore the impact of the safe patient handling law. The focus group findings indicate that the study participants had diverse and mixed experiences since the passage of California's safe patient handling law. The participants reported positive changes in the hospital programs and practices related to the new law and regulations and perceived challenges and barriers for safe practices and injury prevention.

Positive experiences and perceptions include feeling more empowered to advocate for staff safety since the passage of the law, awareness of safe patient handling policies and committee activities, increased provision and variety of lift equipment, more provision of training on safe patient handling, and improvement in safety culture and practices including increased lift use and appreciation of co-worker support.

Perceived concerns and obstacles include continuing barriers to safe practices and lift use, such as insufficient staffing with difficulty in getting assistance, time burden associated with lift use, lack of immediate availability of equipment, lack competence in using the equipment, concerns about quality of care or patient discomfort related to equipment, and patient situations where equipment use was inappropriate. Perceived concerns also include limited availability of lift teams, limited nursing employee input in the safety committee, increased workload and continuing injury concerns, and more punitive management about worker injury. Participants also indicated the need for more effective training, sufficient staffing, supportive environment for worker safety and well-being, and management support for injured workers.

As another interesting finding, two participants noted changes in injury patterns in relation to more frequent use of lift equipment such as ceiling lifts. In the WC data analysis, we found a significant increase of shoulder and neck injury claims. This quantitative study using the WC data shows supporting evidence for the speculation made by the participants, but further research is needed to identify the true cause of increases of shoulder and neck injury claims.

CONCLUSIONS

Our project assessed the impact of California's safe patient handling legislation by using both quantitative and qualitative approaches. By analyzing WC claims data from 2007 to 2016 among California healthcare workers, we identified reductions in the numbers and rates of MSD and PHI claims among hospital workers during the post-legislation period, which may be associated with the safe patient handing legislation. Using the focus groups, we explored nurses and patient handling staff's experiences and perceptions about the safe patient handling law and their hospital programs and practices and obtained complementary information to better explore the impact and changes. The focus group study findings indicated positive changes in the hospital programs and practices related to the new law, along with continuing challenges and barriers for safe practices and injury prevention. These findings may indicate positive impacts associated with the safe patient handling law and regulations; however, due to the limitation of the descriptive observation study design, the positive changes may not be attributed to the law. Our study findings also help to identify the areas for improvement.

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