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Rates of and circumstances surrounding work-related falls from height among union drywall carpenters in Washington State, 1989–2008

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ABSTRACT

Background: Drywall installers are at high risk for work-related falls from height (FFH). *Methods:* We defined a 20-year (1989–2008) cohort of 5,073 union drywall carpenters in Washington State, their worker-hours, and FFH. FFH rate patterns were examined using Poisson regression. *Results:* Drywall installers' FFH rates declined over time and varied little by worker age and time in the union. However, among FFH involving drywall sheets, workers with <10 union years were at high risk. Narratives consistently described the surface from which workers fell, commonly scaffolds (33%), ladders (21%), and stilts (13%). Work task, height fallen, protective equipment use, work speed, weather, influence of other workers/workgroups, and tool/equipment specifics were not often reported. *Practical Applications:* In addition to continued efforts to prevent falls from scaffolds and ladders, efforts should address stilt use and less experienced workers who may have greater exposure. Consistency in reported narrative elements may improve FFH risk factor identification and prevention effort evaluation.

1. Introduction

Despite fall prevention efforts over the past several decades, drywall installers in the United States remain at high risk for injury from work-related falls from height (FFH). In recent studies examining patterns in rates of FFH among a cohort of union carpenters in Washington State, carpenters whose predominant type of work was drywall installation had the highest rates of injuries from FFH overall and with paid lost time (PLT) compared to carpenters in other types of work (Lipscomb, Schoenfisch, Cameron, & Kucera, 2014), with FFH cost rates of $155,500 per 200,000 union hours worked (Lipscomb et al., 2014). Drywall installation work involves lifting, carrying, and hanging increasingly large, heavy sheets of drywall to framed walls or ceilings in residential or commercial buildings. According to data from the Occupational Information Network (O*NET), a program sponsored by the US Department of Labor, drywall installers have the highest exposure to "climbing ladders, scaffolds, or poles at work" and "keeping/regaining balance at work" and the third highest exposure to "working at heights on the job" compared to other construction occupations (The Center for Construction Research and Training, 2013; US Department of Labor/Employment & Training Administration (USDOL/ETA), 2014).

Much of our understanding of work-related injuries in the construction industry, including FFH, comes from the analysis of data from national and state-level resources, particularly the Bureau of Labor Statistics' Survey of Occupational Injuries and Illnesses and workers' compensation (WC) claims. Examination of injury characteristics—often based on American National Standards Institute (ANSI) or Occupational Injury and Illness Classification System (OIICS) coding—have provided an understanding of such injuries by their mechanism, nature, body part affected, and source (Chiou, Pan, & Keane, 2000; Hsiao, & Stanevich, 1996; Lipscomb, Dement, Li, Nolan, & Patterson, 2003; Lipscomb, Dement, Loomis, Silverstein, & Kalat, 1997; Lipscomb, Schoenfisch, Cameron, & Kucera, 2014). While informative, there are notable challenges inherent in the use of these injury event coding structures to study work-related FFH. For example, prior to 2010, ANSI and OIICS coding structures assigned the source of a fall-related injury as the object which "directly produced the injury or illness" (US Department of Labor, 2007). For FFH, this source was often the surface to which the person fell (e.g., floor). The coded injury mechanism could provide limited information on the surface from which the person fell (e.g., "fall from ladder"), although broader, less-informative injury event codes were available for use as well (e.g., "fall to lower level")—a potential limitation from the standpoint of developing or evaluating targeted fall prevention efforts. Also, codes are not available to capture specific circumstantial details that could be beneficial in informing the

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development and evaluation of fall prevention interventions, such as the work task being performed or assistive devices being used.

Narrative text data have been recognized as a useful supplement to coded injury data in occupational injury research (McKenzie, Scott, Campbell, & McClure, 2010; Sorock et al., 1997), including in the construction industry (Baggs, Cohen, Kalat, & Silverstein, 2001; Bondy, Lipscomb, Guarini, & Glazner, 2005; Dement, Lipscomb, Li, Epling, & Desai, 2003; Lipscomb, Glazner, Bondy, Lezotte, & Guarini, 2004; Lombardi et al., 2005; Schoenfisch et al., 2013; Shah, Bonauto, Silverstein, Foley, & Kalat, 2003). They have been used to identify outcome events not captured through code-based methods, as well as to provide additional circumstantial detail surrounding the injury event.

The purpose of this study was to describe patterns in drywall installers' rates of work-related injury from FFH over time, by worker characteristics, and in comparison to patterns observed among carpenters in other predominant types of work. Additionally, we aimed to identify characteristics of and circumstances surrounding drywall installers' injury events using a combination of coded WC claims data and an analysis of injury event narratives. In so doing, we sought to describe the utility of these narratives in providing event details beyond those captured through coded WC claims alone.

2. Methods

2.1. Cohort data

Administrative data files from the Carpenters Trusts of Western Washington (CTWW) were used to define a historical, dynamic cohort of union carpenters in Washington State from 1989 through 2008 (McCoy, Kucera, Schoenfisch, Silverstein, & Lipscomb, 2013). Data available for each carpenter included date of birth, gender, date of union initiation, union local affiliation, and hours of union work per month. Union local affiliation was used to characterize work performed, defined for these analyses as drywall installation or other carpentry (which includes light and heavy commercial, millwrighting, piledriving, residential carpentry, or mixed). Union carpenters who perform drywall installation in Washington State hang drywall in residential and commercial settings but they do not apply tape/joint compound or sand.

Union work hours were used as the measure of time at risk for a FFH injury. Union hours worked during a given month were considered time at risk for any FFH injury occurring during that month. Covariates of interest included predominant type of work, calendar time, gender, age, and time in the union. Carpenters typically spend four years in apprenticeship training prior to receiving journey-level status, and time in the union was categorized to explore rates of injury from FFH by periods of time within workers' apprenticeship (<4 years in the union) and journeyman (≥4 to 10 years in the union; 10 or more years in the union) years of experience separately.

2.2. WC claims data and narrative text data

The Washington State Department of Labor and Industries (L&I) provided WC claims for the 20-year study period, 1989 through 2008. Data elements available for each work-related injury included event date, amount of PLT (which occurs after the third lost day of work in Washington State), body part affected, nature of the injury, type of event or exposure leading to the injury (i.e., mechanism), and source of the injury. ANSI codes were used from 1989 through June 2005, and OIICS (version 1.01) codes were used from July 2005 forward for body part, nature of injury, event or exposure leading to the injury (i.e., mechanism), and source of the injury. Claims from self-insured employers were included in the rate-based analyses. However, these claims were not assigned ANSI/OIICS codes at L&I if they did not result in PLT. Brief injury event narratives (median length: 9 words), also provided by L&I, were available as a separate file with a unique WC claim number used for matching.

WC claims and narratives were linked to the study cohort at the level of the worker, month and year using an encrypted worker identifier and date of injury. All reported and accepted WC claims with an ANSI or OIICS code indicative of a fall from height or jump to a lower level and occurring during months in which the carpenter worked union hours were considered outcomes of interest. Individual workers were allowed to contribute more than one FFH injury per month.

2.3. Analyses

Stratified by the predominant type of work performed (i.e., drywall installation, other carpentry), the frequency and proportion of FFH injuries and worker-hours at risk were calculated overall, by worker characteristics, and over calendar time. FFH injuries were also examined by whether drywall material was a contributing factor in the injury event. Poisson regression was used to calculate FFH injury rates, crude and adjusted rate ratios (RR), and 95% confidence intervals (CI). Potential confounding factors of age and time in the union were included in multivariate models. Injury rates were expressed as the number of injuries per 200,000 worker-hours. Worker age and time in the union were allowed to vary over time so that time at risk was correctly allocated to the appropriate strata over the 20-year study period.

Coding of the FFH injury event narratives was performed manually. Initial event coding categories were framed by the authors around potential contributory factors such as task in which the worker was engaged, tool/equipment/assistive device used, malfunction of tool/equipment/assistive device, the surface from which the worker fell, and the height of the fall. As the need for new categories and subcategories arose, they were incorporated into the narrative coding tool (an electronic form), and previously-coded events were re-reviewed for the new information to be extracted. Prior to this coding effort, claims had been categorized by whether drywall material was a contributing factor in the injury event based on a combination of ANSI/OIICS source of injury codes and injury event narratives. This process has been described in detail (Schoenfisch et al., 2013).

Characteristics of FFH injury events based on ANSI/OIICS codes and investigator-catalogued details gathered through the narrative review (e.g., work task, surface from which the worker fell) were described.

Narrative text analyses used Microsoft Access (Microsoft Corporation, 2010). SAS 9.1.3 (SAS Institute Inc., 2002–2004) was used for generation of descriptive statistics and rate-based analyses.

Study procedures were approved by the Institutional Review Boards at Duke University Medical Center, the Washington State Department of Health and Human Services, and the University of North Carolina at Chapel Hill.

3. Results

3.1. Study cohort and patterns in rates of fall-related injuries

The study cohort was comprised of 5,073 workers who belonged to a union local with a predominant type of work of drywall installation. These workers, including their time at risk and injury epidemiology, and rates of FFH injury relative to carpenters in other types of work have been described in detail previously (Lipscomb, Schoenfisch, Cameron, & Kucera, 2014; Schoenfisch et al., 2013; Schoenfisch et al., 2014). Briefly, at entry into the study cohort, drywall installers had a mean age of 31.0 years and averaged 3.2 years in the union. Compared to other carpenters, drywall installers were (on average), 3.9 years younger and had 2.5 fewer years in the union. From 1989 through 2008, drywall installers contributed a total of 36,673,255 union work hours, and 6,066 work-related injuries were accepted through WC for an overall rate of 33.1 work-related injuries per 200,000 worker-hours. FFH injuries made up 7.4% ($n = 446$) of drywall installers' injuries and were more likely to result in PLT (41.3%) compared to injuries from other mechanisms (20.5%).