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The Aging Healthcare Workforce: Employment and Occupational Injuries Among Workers in US Private Hospitals During 2010

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Editor's note: In this issue's Ready to Research column, we are pleased to expand our usual educational content to feature an article that both exemplifies the research process and provides subject matter very relevant to occupational health practice in the hospital setting. I am grateful to AOHP members Ken Scott and Lee Newman for choosing the AOHP Journal *as the venue in which to share this informative research on the aging healthcare workforce with the occupational health community.*

Abstract

It is commonly acknowledged that the healthcare workforce is aging. That said, occupational health professionals working in the healthcare sector lack a strong research base to help guide whether to prepare or how to prepare for the aging workforce. Few, if any, studies have explicitly examined the relationships between age and occupational injury risks among healthcare workers. While studies of other industries suggest potential differences between older and younger workers' injury risks, additional research should confirm or deny whether the age-related injury patterns in healthcare mirror patterns in other industries. This study analyzed data from the 2010 Bureau of Labor Statistics Survey of Occupational Injuries and Illnesses and data from the Current Population Survey to develop benchmarks against which organizations can compare their own data.

Introduction

Every worker ages with each passing workday. An "aging workforce," on the other hand, refers to a broader societal trend in which the ratio of older workers relative to younger workers increases over time. A shift in the ratio of older workers compared to younger workers will affect individual employers,[1] as well as entire sectors of the US economy.[2] While the implications of an aging workforce should not be overstated, it is important to understand how older and younger workers differ from one another, on average. It is also important to pay close attention to the demographic trends that are already underway to help employers adjust their programs, policies and practices to optimize the effectiveness of their older and younger workers.

An aging workforce will have consequences for employee health and safety programs in healthcare organizations, as in other sectors of industry. Research dating back to at least 1940 has found that the patterns of occupational injuries and illnesses change over employees' working lives, though few studies have characterized the impact of aging in the healthcare workforce, specifically. Norman Root's 1981 analysis of workers' compensation data from 30 states stands as one of the most comprehensive studies in the United States describing the age-related changes in the occurrence of occupational injuries.[3] Root identified several patterns that have since been observed in other studies.

Root found that a large proportion of occupational injuries occurred among workers in the first year of employment. More recently, Breslin, et al observed similar patterns.[4-6] Injury risk is strongly associated with job tenure among older workers, as well as younger workers.[5] Younger workers are more likely to be new to the job, compared to older workers. Inexperience, therefore, is an important age-related contributor to injury risk. Second, Root's analysis concluded that the occurrence of severe occupational injury increases with increasing age, including fatal injuries and injuries resulting in permanent disability. Similar trends have been observed with respect to specific industries[7] and specific types of injuries,[8,9,10] as well as in other large cross-industry studies similar to Root's.[11] Third, Root

found that the frequency of occupational injury generally decreases with age. A study by the National Institute for Occupational Safety and Health (NIOSH,) in partnership with a number of state agencies,[11] found decreases in particular types of injuries with increasing age (e.g. injuries resulting from contact with objects and equipment.) The NIOSH study did not find a clear trend with increasing age when all injury types were combined. Fourth, injuries resulting from falls on the same level were, in Root's analysis, a notable exception to the general patterns he observed with other injury types. Fall-related injuries were more common among older workers than younger workers. Similar trends were observed in the NIOSH study mentioned previously. Some studies of construction workers and healthcare workers that did not explicitly focus on aging have also found statistical associations between older age and an increased risk of a slip, trip and fall injury.[12,13] Root suggested that several "mechanisms" may influence these differential patterns observed with increasing age, including inexperience, age-related physiological changes and "occupational restraints" that formally or informally classify a worker as "too young" or "too old" for a given job.

Despite the fact that research on aging and occupational injury risk dates back more than seven decades, in our literature search, we found no studies that directly explore how the patterns for the healthcare workforce compare with the trends for the US workforce as a whole. This study aims to help fill the gap in the literature by analyzing data collected by the Bureau of Labor Statistics through the Survey of Occupational Injuries and Illnesses. The Survey of Occupational Illnesses and Injuries provides useful benchmarks for occupational health professionals in healthcare, especially since more accurate benchmarks do not exist. Occupational health and human resources professionals who work in hospitals may also find it useful to benchmark the age distribution of their own workforce against the national hospital workforce as a whole. Therefore, in addition to analyzing trends of occupational injuries, this paper will present data from the Current Population Survey, describing the numbers and percentages of US workers employed in private hospitals for their primary occupation.

We aim to use demographic and injury data on employees of US hospitals to test four hypotheses, based on cross-industry trends mentioned above:

- Hypothesis 1: Rates of slip, trip and fall injuries on the same level increase with increasing age.
- Hypothesis 2: Rates of injuries due to overexertion do not exhibit a linear trend.
- Hypothesis 3: Rates of injuries due to contact with objects and equipment decrease with increasing age.
- Hypothesis 4: Rates of injuries due to assaults or violent acts do not exhibit a linear trend.

METHODS

Data

The Current Population Survey

The Current Population Survey (CPS) is a monthly survey of about 60,000 households conducted by the US Census Bureau for the Bureau of Labor Statistics. The survey is conducted in a way to ensure that the group of people who are surveyed is representative of the US population as a whole.

We used CPS data to describe the age distribution of workers employed in private US hospitals during 2010. Private hospitals include hospitals that are privately owned, including for-profit and not-for-profit hospitals. Private hospitals exclude hospitals owned by federal, state or local governments. The CPS is administered each month, and weights are developed for each respondent to estimate the approximate number of Americans who possess that particular respondent's characteristics. Based on these weights, we calculated the number of employees working in private hospitals in the United States for their primary job in each of seven age groups.

The Survey of Occupational Injuries and Illnesses

The Survey of Occupational Injuries and Illnesses (SOII) is one way that government agencies and researchers estimate the number of non-fatal work-related injuries and illnesses that occur in the United States each year. The Bureau of Labor Statistics (BLS) collects data from a sample of approximately 200,000 employers from across the United States each year. Employers are asked to report details about work-related injuries and illnesses that their employees have experienced. The data collected by SOII can be combined with CPS data to estimate the rate, or frequency, at which occupational injuries and illnesses are occurring within demographic subgroups.[14] Comparing injury rates in addition to the number of injuries is useful for assessing patterns in employers and industries of different sizes.

We used data collected by SOII to estimate the number of injuries in each of seven age groups that: involved days away from work: were experienced by workers employed in US private hospitals as their primary occupation; and resulted from a fall on the same level, overexertion, contact with objects and equipment, assaults or violent acts. These data were then combined with CPS data on hours worked per week to develop age-group-specific incidence rates, per the method used by BLS to calculate injury incidence rates. The number of injuries involving days away from work experienced by a given age group was divided by the total number of hours worked by hospital workers in the same age group in 2010. This value was then multiplied by the average number of hours in a workweek (40 hours,) an estimate of the number of working weeks in a year (50 weeks) and by 100 employees. The resulting incidence rate can be interpreted as the number of injuries involving days away from work expected over the course of a year for every 100 full-time employees.

Statistical Analysis

To assess for trends, we conducted the Chi-Square test for trend for each of the four hypotheses listed above. We conducted double-sided tests, and our level of statistical significance was set at

p=0.05. For both the descriptive statistics and for the hypothesis testing, we used the statistical software package R[15] (version 2.15.3.)

RESULTS

According to our estimates, 5.6 million healthcare workers were employed in private hospitals for their primary occupation during 2010 (Table 1 and Figure 1.) The largest percentage of those workers was between the ages of 45 and 54. The next largest age groups were workers 35-44 and 25-34, respectively, followed by workers 55-64, 20-24, 70-74, 18-19 and 75+.

Overexertion injuries comprised the greatest number of lost-time injuries among the injury categories we included in our analysis, followed by same-level falls, contact with objects and equipment, assaults and violent acts (Table 2 and Figure 2.)

Data on injury rates suggest different age patterns than do the data on injury counts (Table 2 and Figure 3.) As predicted, the rates of injuries due to falls on the same level increase steadily with age. The rate of same-level fall injuries is five times higher among workers age 75+ than among workers age 18-19. Overexertion injury rates decline with increasing age. Rates of injuries due to contact with objects and equipment decline sharply until the 25-34 year age group and remain relatively stable until increasing slightly among workers 75 and older. Injuries due to assaults and violent acts decline steadily with age, though the rates are relatively low to begin with, and the change is subtle compared to the fluctuations in the other injury types. Each of the four injury rate trends was found to be statistically significant ($p < 0.0001$.)

DISCUSSION

During 2010, only 3.17 percent of the hospital workforce was at or above the traditional retirement age of 65. Almost 18 percent of the 2010 workforce will reach that milestone by 2020, if the individuals who were employed in hospitals in 2010 remain employed. Recent efforts to recruit new nurses into the healthcare field will help mitigate this massive demographic shift to ensure adequate numbers of healthcare workers.[16] That said, the healthcare sector will rely increasingly on older healthcare workers in the coming decades. As such, it will be increasingly important for US hospitals and other employers in the healthcare sector to analyze their workforce demographics and to tailor their employee safety and health programs and policies to support workers of all ages.[17,18]

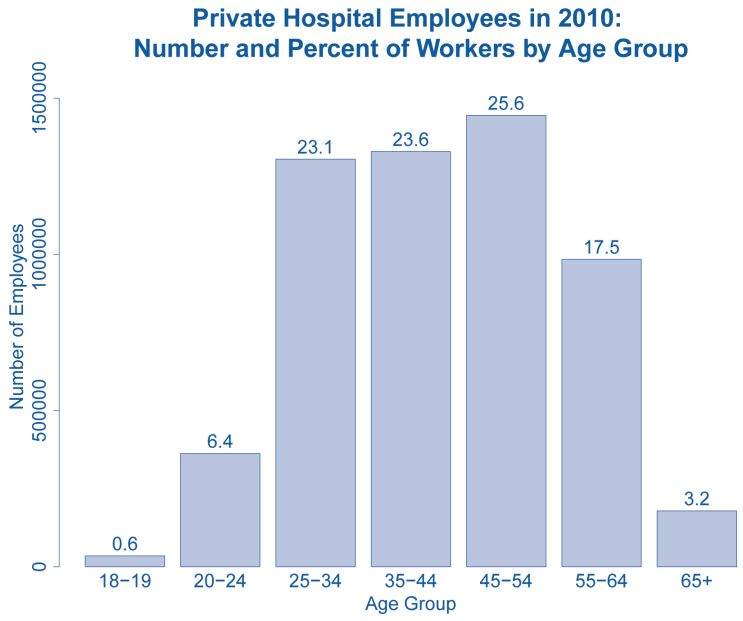
Our analyses confirm the findings of previous studies of healthcare workers and non-healthcare workers, that slip, trip and fall related injuries on the same level become increasingly common as workers in private US hospitals age. The data presented in this article exhibits a clear dose-response relationship. As in other studies,[11] our analyses suggest that younger workers (those between 18 and 19 years of age, in particular) are most likely to experience an occupational injury due to contact with objects or equipment. Unlike previous research,[11] however, younger healthcare workers appear to be most likely to experience an overexertion injury. Our research is the first, to our knowledge, to analyze US hospital workers' age-group-specific injury risks due to assaults and violent acts. Violent injury rates are highest among younger workers.

Table 1: Estimated Number and Percentage of US Healthcare Workers in Private Hospitals* by Age Group, 2010

Age Group	Number of Employees (%)
18-19	34,663 (0.61)
20-24	362,617 (6.43)
25-34	1,304,194 (23.13)
35-44	1,328,644 (23.57)
45-54	1,444,648 (25.63)
55-64	983,912 (17.45)
65-69	110,702 (1.96)
70-74	36,651 (0.65)
75+	31,362 (0.56)
Total	5,637,391 (100.00)

Data: Current Population Survey
** Estimates do not include healthcare workers who did not claim employment in a hospital as their primary job.*

Figure 1:
Number and Percent of Workers in Private US Hospitals by Age Group, 2010



Our findings are consistent with the broader literature on older adult falls – which also demonstrates that falls become more common with increasing age.[19] The literature on older adult falls suggests that age-related physiological changes in balance, reaction time, gait and a number of other factors interact with environmental hazards to explain much of the increased risk of a fall with increasing age.[20] Prevention activities, therefore, may need to focus on modifying host factors (e.g. tai chi to improve older adults' balance,) environmental factors (e.g. modifications to the home environment) or both. One large study conducted in the healthcare work environment was able to demonstrably decrease the frequency of slip, trip and fall-related workers' compensation claims through environmental modifications.[12] Systematic reviews have found host-level fall-prevention interventions can be effective among older adults.[21] While occupational safety and health professionals justifiably prioritize environmental modifications over host-level interventions, efforts to improve workers' balance and reaction time to reduce their risk of an occupational slip, trip and fall may complement the environmental modifications described by Bell, et al.

Figure 2:
Number of Occupational Injuries Involving One or More Days Away from Work by Age Group and Injury Type, 2010

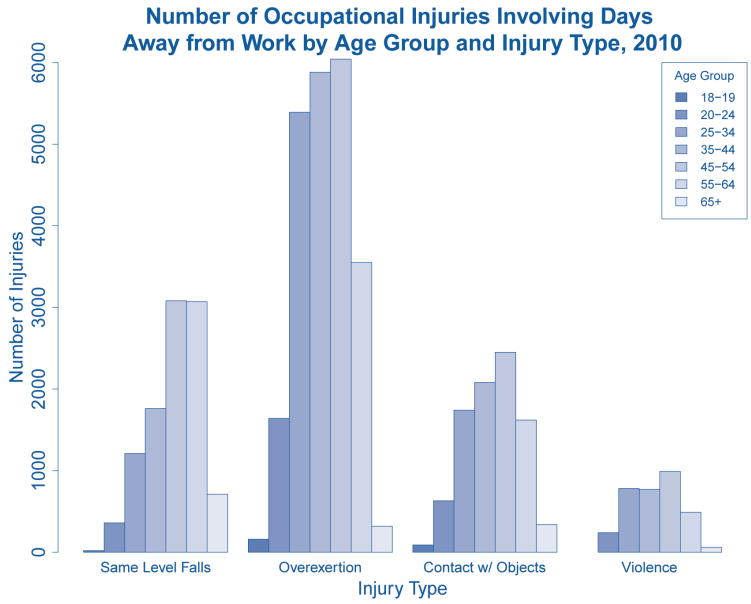


Table 2: Estimated Number and Rate of Select Occupational Injury Types in Private US Hospitals, by Age Group, 2010

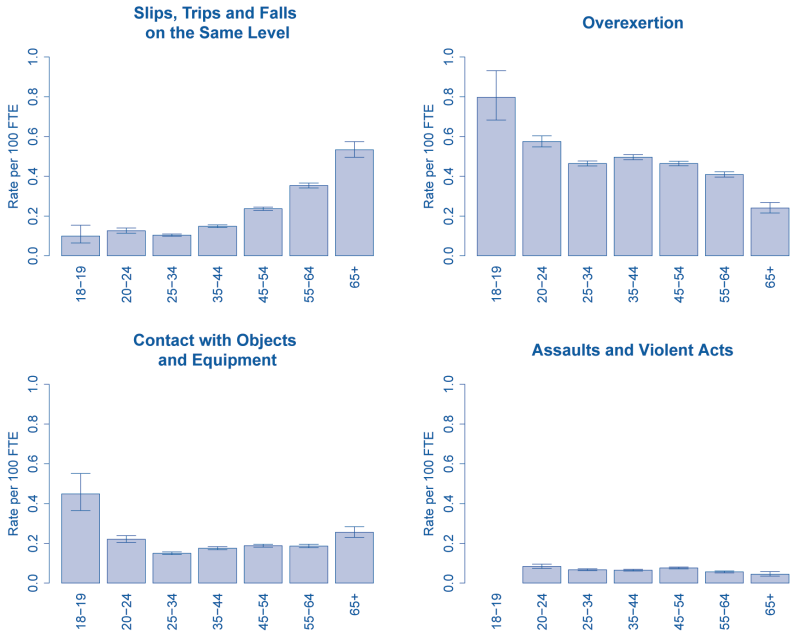
Age Group	Slip, Trip and Fall*		Overexertion*		Contact with Objects and Equipment*		Assaults and Violent Acts*	
	Count (%)	Rate (95% CI)	Count (%)	Rate (95% CI)	Count (%)	Rate (95% CI)	Count (%)	Rate (95% CI)
18-19	20 (0.2)	0.100 (0.06, 0.15)	160 (0.7)	0.797 (0.68, 0.93)	90 (1.0)	0.448 (0.37, 0.55)	NA	NA
20-24	360 (3.5)	0.126 (0.11, 0.14)	1,640 (7.1)	0.575 (0.55, 0.60)	630 (7.0)	0.221 (0.20, 0.24)	240 (7.2)	0.084 (0.7, 0.1)
25-34	1,210 (11.9)	0.104 (0.10, 0.11)	5,390 (23.5)	0.464 (0.45, 0.48)	1,740 (19.4)	0.150 (0.14, 0.16)	780 (23.4)	0.067 (0.06, 0.07)
35-44	1,760 (17.2)	0.149 (0.14, 0.16)	5,880 (25.6)	0.496 (0.48, 0.51)	2,080 (23.2)	0.176 (0.17, 0.18)	770 (23.1)	0.065 (0.06, 0.07)
45-54	3,080 (30.2)	0.237 (0.23, 0.25)	6,040 (26.3)	0.464 (0.45, 0.48)	2,450 (27.4)	0.188 (0.18, 0.20)	990 (29.7)	0.076 (0.07, 0.08)
55-64	3,070 (30.1)	0.354 (0.34, 0.37)	3,550 (15.4)	0.409 (0.40, 0.42)	1,620 (18.1)	0.187 (0.18, 0.20)	490 (14.7)	0.056 (0.05, 0.06)
65+	710 (7.0)	0.533 (0.50, 0.57)	320 (1.4)	0.240 (0.22, 0.27)	340 (3.8)	0.255 (0.23, 0.28)	60 (1.8)	0.045 (0.04, 0.06)
Total	10,210 (100)	0.21 (0.20, 0.22)	22,980 (100)	0.46 (0.46, 0.47)	8,950 (100)	0.18 (0.18, 0.18)	3,330 (100)	0.07 (0.06,0.07)

Data: Current Population Survey & Survey of Occupational Injuries and Illnesses

Rates are calculated as the number of injuries involving days away from work per 100 FTE
* Indicates a statistically significant test for trend in rates, using Chi-Square test for trend and a significance level of p=0.05
Excluded from this analysis were records with critical missing data on age group, injury source or detailed industry, as well as data on workers < 18 years of age.

The data presented here are cross-sectional in nature, which necessarily prohibits any assessment of causation. In other words, while we can

Figure 3: Rates of Occupational Injury Involving One or More Days Away from Work by Age Group and Injury Type, 2010



describe what the patterns are, the data do not allow us to explain why the patterns are the way they are. Root's intriguing "mechanisms" that might explain the patterns we observed, in whole or in part, cannot be evaluated with the data in this study. In addition to the cross-sectional nature of the data, this study is limited by the accuracy and the precision of the data that was analyzed. Both the CPS and the SOII have limitations that have been well documented.[22]

Based on these and other data, we conclude that enhanced slip, trip and fall prevention activities are warranted as the healthcare workforce ages. Given that other studies show increasing injury severity with age, the cost-effectiveness of preventing injuries may change with increasing age. Additional research should be done to examine whether the cost-effectiveness of occupational safety and health interventions change with age.

The degree to which an aging workforce impacts a particular employer's bottom line will be influenced by many factors, some of which are under the control of an organization and some of which are not. Regardless, considering that nearly 18 percent of the private US hospital workforce is within 10 years of turning 65, healthcare organizations would be well-advised to begin analyzing their workforce demographics, as well as safety and wellness practices, programs and policies that may keep older hospital workers healthy, safe and productive on the job.

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