

ORIGINAL ARTICLE

Occupational injury risk among ambulance officers and paramedics compared with other healthcare workers in Victoria, Australia: analysis of workers' compensation claims from 2003 to 2012

Minainyo Helen Roberts,¹ Malcolm Ross Sim,¹ Ollie Black,¹ Peter Smith^{1,2,3}

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/oemed-2014-102574>).

¹Department of Epidemiology and Preventive Medicine, School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia

²Institute for Work and Health, Toronto, Ontario, Canada

³Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada

Correspondence to

Dr Peter Smith, Department of Epidemiology and Preventive Medicine, School of Public Health and Preventive Medicine, Monash Centre for Occupational and Environmental Health (MonCOEH), Monash University, The Alfred Centre, 99 Commercial Road, Melbourne, VIC 3004, Australia; peter.smith@monash.edu

Received 16 September 2014

Revised 3 February 2015

Accepted 21 February 2015

ABSTRACT

Objective To investigate occupational risk of musculoskeletal (MSK) and mental injury among ambulance officers and paramedics, and compare with nurse professionals, social and welfare professionals, and carers and aides in Victoria, Australia, using workers' compensation (WC) claims statistics.

Methods Data were retrieved from the Victorian Compensation Research Database (CRD). Analysis was restricted to claims received between 1 July 2003 and 30 June 2012. WC claim rates were calculated using labour force statistics, and expressed per 1000 full-time equivalent workers. Adjusted HRs with 95% CIs for injury risk were estimated using multivariable regression modelling.

Results Ambulance officers and paramedics had an upward trend in WC claim rates for all injuries and the highest rates for MSK and mental injury, in comparison with other healthcare workers during the study period. In the 2009–2012 time period, ambulance officers and paramedics' risk of lower back MSK and mental injury was approximately 13 times higher than nurse professionals, HRs 57.6 vs 4.4 and 17.77 vs 1.29, respectively. Social and welfare professionals had the second highest risk of mental injury, which was up to threefold greater than in nurses. Carers and aides and nurse professionals had similar HRs overall for all injury categories.

Conclusions Differential patterns of MSK and mental injury exist among healthcare occupational groups in Victoria, Australia. Given the significant findings, especially the high risks among ambulance personnel, future research should focus on the circumstances of injury to improve understanding and inform prevention programmes.

INTRODUCTION

The most commonly reported occupational afflictions experienced by healthcare workers are musculoskeletal (MSK) injuries.¹ Employees who provide direct patient care such as nurses and nursing aides are known to be particularly at risk.^{2–3} Workplace Safety Agencies in Western industrialised countries routinely collect and analyse workers' compensation (WC) claims data, to illustrate on-going burden of work-related disorders. This approach has illuminated injury patterns and trends within the healthcare sector.

What this paper adds

- Musculoskeletal (MSK) injuries, in particular of the lower back, are well documented among nurses and their assistants.
- The injury patterns of other healthcare workers who provide direct patient care, such as ambulance personnel, is not often examined.
- On the basis of workers' compensation claims data, this study revealed that ambulance officers and paramedics have elevated and increasing risks of MSK (lower back > upper limb) and mental injury, and social and welfare professionals have a high though less marked risk of mental injury, compared with nurse professionals.
- Thus, ambulance personnel and social and welfare workers have significant injury risks, but are relatively under-researched healthcare occupational groups.
- Future research should focus on the risk factors and circumstances of work-related injury, especially among ambulance officers and paramedics, to improve understanding of our findings and subsequently inform prevention programmes.

In one of the earlier studies, Yassi *et al*⁴ reported a decline in national time-loss injury rates over a 10-year period across healthcare workplaces in Canada, including for MSK injuries which comprised the majority of WC claims. Other researchers who also compared injury risk among specific occupational groups reported similar trends in WC claim rates, and also confirmed that occupational injury risk was highest among workers who provide care specific to patients' needs.^{5–8} Thus, the outcome of research to-date suggests decreasing injury incidence within the healthcare industry.

Some of these studies, however, are limited by inclusion of broad or diverse occupational groups, or by their focus on just a few, namely nurses and their assistants. As such, it has been difficult to determine the distribution of injury burden among occupations with comparable job requirements in the wider healthcare sector. Injuries are often categorised under the general rubric of 'MSK' or

To cite: Roberts MH, Sim MR, Black O, *et al*. *Occup Environ Med* Published Online First: [please include Day Month Year] doi:10.1136/oemed-2014-102574

'sprains and strains', or invariably involve just the lower back. Furthermore, as trends in injury rates (or risks) for specific body regions are rarely examined, their relative impact is not easily gauged.

Though the lower back (and MSK injury in general) consistently accounts for a significant proportion of WC claims, the data suggest that upper limb MSK and mental injury are among other important work-related conditions reported by healthcare workers.¹ Upper limb, like lower back, MSK injuries are associated with heavy, repetitive manual handling and tasks performed in awkward postures.⁹ Mental injury, within the Victorian legislation, refers to disorders that result from exposure to workplace stressors such as traumatic situations, violence and work pressure, and include anxiety, depression and nervous breakdown.¹⁰ Similarly, WC claims for mental injury are common, costly and result in lengthy lost work days.^{11–13} Moreover, these conditions have been described among other direct patient care occupational groups, such as social workers and ambulance officers and paramedics, but they have infrequently been the focus of research, at least using WC claims data.

In their analysis of claims data, Maguire *et al*¹⁴ found that occupational injury risk among Australian paramedics was over seven times higher than the national average for all workers between 2000 and 2010. An earlier Safe Work Australia report ranked ambulance officers and paramedics third among occupations with the highest WC claim rates for mental disorders between 2006–2007 and 2008–2009.¹⁰ Reviews have revealed that ambulance officers have comparable prevalences of lower back MSK disorders as nurses, and highlighted that neck and shoulder MSK disorders are not uncommon.^{15–16} Ambulance personnel are exposed to several occupational hazards, consequently their risk of injury may be particularly high. Changing and higher physical job demands involving handling patients and equipment, and increased exposure to distressing and tragic events and violence are characteristic of ambulance personnel work.^{15–17}

Social and welfare workers are also occupationally-exposed to psychological hazards as a result of their responsibility for the welfare of vulnerable population groups, combined with a high workload and limited resources. Within this profession, work-related stress and burnout are oft-cited sequelae.¹⁸ However, as with ambulance personnel, little is known about how their risk of injury compares with other healthcare occupational groups with similar job requirements.

Thus, this study will contribute to knowledge of work-related conditions within the broader healthcare sector, by examining the incidence and patterns of specific injury types among several direct patient care occupational groups. The main objective was to investigate occupational risk of lower back and upper limb MSK injury and mental injury among ambulance officers and paramedics, and compare with social and welfare professionals, nurse professionals, and carers and aides in Victoria, Australia, using WC claims submitted between 2003 and 2012.

METHODS

WC system, Victoria

The Victorian WorkCover Authority (VWA) provides WC insurance to approximately 85% of workers in the state of Victoria, in Australia. Excluded from WC coverage includes persons working for employers who self-insure, Federal government agency employees, self-employed and sole traders (individuals who trade, control and manage a business on their own). For the purposes of this study we focused on standard WC claims.

A standard WC claim in Victoria results when a threshold level of medical expenses is reached (\$610 in 2011/2012), or when a worker has been absent from work for 10 or more days.

Compensation Research Database

The Compensation Research Database (CRD) consists of all administrative WC claims data from the VWA, lodged from 1 January 1986. The database contains information on claimants, including demography, industry, occupation, employer, workplace, injury, claim costs and payment summary. Ethics approval for use of WC claims data was received from Monash University Human Research Ethics Committee.

Study population and design

We examined standard claims submitted to the VWA with an injury date between 1 July 2003 and 30 June 2012. WC claim rates were calculated by combining claims data from the CRD with labour force estimates from Safe Work Australia's National Dataset for Compensation-Based Statistics. These denominator data are derived principally from the Australian Bureau of Statistics (ABS) Labour Force Survey (LFS), and adjusted to account for differences in scope between the LFS and WC coverage. Adjustments are also made to hours worked by different occupations to reflect workers employed in more than one job. The one exception is for self-insurers who encompass a range of industries. For the purposes of our analyses, the impact of the inclusion of these employers is likely minor as the majority are in the food services and goods-producing industries. However, as these employers are not required to report injuries to the VWA, WC claim rates reported in this paper may be slightly underestimated.

WC claims data and labour force estimates were categorised as follows:

Occupation: Occupational groups were identified using the Australian Standard Classification of Occupations (ASCO) codes. We derived the following 11 groups: Ambulance officers and paramedics; Nurse professionals; Carers and aides; Social and welfare professionals; Other professionals, Associate professionals, and Managers and administrators; Advanced clerical and service workers; other Intermediate clerical, sales and service workers; Elementary clerical, sales and service workers; Intermediate production and transport workers; Tradespersons and related workers; and Labourers and related workers. For the purposes of this study we focused on six occupational groups: four direct care health-related occupational groups—ambulance officers and paramedics (ASCO 4-digit code 3491), nurse professionals (ASCO 3-digit code 232), carers and aides (ASCO 3-digit code 631), and social and welfare professionals (ASCO 3-digit code 251); and two reference occupational groups—managers and other professionals (ASCO 1-digit code 1 and 2), and tradespersons and labourers (ASCO 1-digit code 4 and 9). These two reference groups were chosen as they represent groups of occupations with, a low risk for MSK and mental injury (managers and other professional groups), and a high risk for MSK injury (tradespersons and labourers).

Injury type: Injury types were identified using the nature of affliction and bodily location of injury associated with each claim, based on the Type of Occurrence Classification System (TOOCS, 3rd edition). We focused on the following three injury types: lower back and upper limb MSK injury, and mental injury. Demographic information such as gender and age in 5-year categories, and financial year (ie, 1 July–30 June of consecutive years) in which the injury occurred were also included.

Analysis

Descriptive statistics were used to characterise the distribution of compensation claims by gender, age group, financial year of claim and nature of affliction. WC claim rates for occupational groups and injury categories were calculated using labour force estimates, and expressed per 1000 full-time equivalent (FTE) workers. A FTE equates to 2000 h worked in a year. Safe Work Australia provides data by industry and occupational groups separately, so analyses were conducted accordingly. CIs for WC claim rates to assess trends in injury rates over time were estimated using methods previously described by Breslin *et al.*¹⁹ Gender and age-adjusted HRs with 95% CIs for risk of MSK and mental injury across occupational groups were estimated using multivariable regression models. Our models included the number of claims within each occupation by age, gender and financial year group as the outcome, with the associated FTE count log transformed and included in the regression model as an offset. Given the count nature of our data we assumed a Poisson distribution in our models. To examine differences in risk of injury across occupational groups over time, we ran additional regression models focused on three separate time periods, 2003–2005, 2006–2008 and 2009–2012. Years were grouped in order to reduce yearly fluctuations in our data. All data analyses were performed using PROC GENMOD in SAS.²⁰

RESULTS

Table 1 shows the frequency, rate and relative risk of WC claims by gender, age group and occupational group in Victoria, Australia, from 2003 to 2012. There were 214 355 WC claims over the 9-year observation period among the six occupational groups. In general, the relative risk of WC claims increased with age but there was no difference by gender. Ambulance officers and paramedics had the highest WC claim rates at over 100/1000 FTEs, which was approximately five times higher than the rates for nurse professionals, carers and aides and social and welfare professionals. MSK injuries accounted for more than half of all WC claims among the occupational groups, while mental injury accounted for just under one-tenth.

Figure 1 illustrates the trends in WC claim rates for all injuries among six occupational groups and for all healthcare occupational groups, over three time periods. Associated CIs for the WC claim rates are presented in online supplementary table A1. There was a decline in claim rates among a majority of the groups and for all healthcare workers combined. The two exceptions were social and welfare professionals and ambulance officers and paramedics. Ambulance officers and paramedics had an upward trend in WC claim rates, which almost doubled over the study period. Ambulance officers and paramedics also had the highest WC claim rates during all three time periods, over 2.5-fold and around sevenfold greater than WC claim rates

Table 1 Frequency, rate and unadjusted relative risk of workers' compensation claims by selected characteristics for six occupational groups in Victoria, Australia, 2003 to 2012

Characteristics	Number of WC claims	(%)	Claim rates/ 1000 FTEs	RR	95% CI
Gender					
Male	138 369	(64.6)	16.0	1.00	Ref
Female	75 986	(35.4)	16.2	1.01	(1.00 to 1.02)
Occupational group					
Nurse professionals	10 256	(4.8)	23.5	3.13	(3.06 to 3.19)
Social and welfare professionals	4674	(2.2)	20.9	2.77	(2.69 to 2.86)
Ambulance officers and paramedics	2632	(1.2)	102.2	13.58	(13.06 to 14.12)
Carers and aides	13 045	(6.1)	27.0	3.58	(3.52 to 3.65)
Tradespersons and labourers	120 594	(56.2)	32.0	4.25	(4.21 to 4.29)
Managers and other professionals	63 154	(29.5)	7.5	1.00	Ref
Age group					
<20	4782	(2.2)	14.0	1.00	Ref
20–24	15 466	(7.2)	12.8	0.91	(0.88 to 0.94)
25–29	19 361	(9.0)	11.3	0.81	(0.78 to 0.83)
30–34	22 147	(10.3)	12.8	0.91	(0.89 to 0.94)
35–39	25 086	(11.7)	14.9	1.07	(1.03 to 1.10)
40–44	28 252	(13.2)	16.5	1.18	(1.14 to 1.21)
45–49	30 976	(14.5)	18.3	1.30	(1.26 to 1.34)
50–54	29 940	(14.0)	19.9	1.42	(1.38 to 1.46)
55–59	22 159	(10.3)	21.4	1.53	(1.48 to 1.57)
60–64	12 357	(5.8)	23.5	1.67	(1.62 to 1.73)
≥65	3829	(1.8)	20.1	1.43	(1.37 to 1.50)
Injury category					
Musculoskeletal	116 249	(54.2)	8.72		
Lower back	32 068	(15.0)	2.40		
Upper limb	28 376	(13.2)	2.13		
Mental	20 215	(9.4)	1.52		
*Other	77 891	(36.3)	5.84		

*Injury types other than MSK or mental injury for example, poisoning, infections and parasites, nervous system and sense organs, systemic diseases, fractures and wounds. FTEs, full time equivalents; MSK, musculoskeletal; RR, relative risk (unadjusted); Ref, reference group; Upper limb, upper back, shoulder, neck; WC, workers' compensation.

Workplace

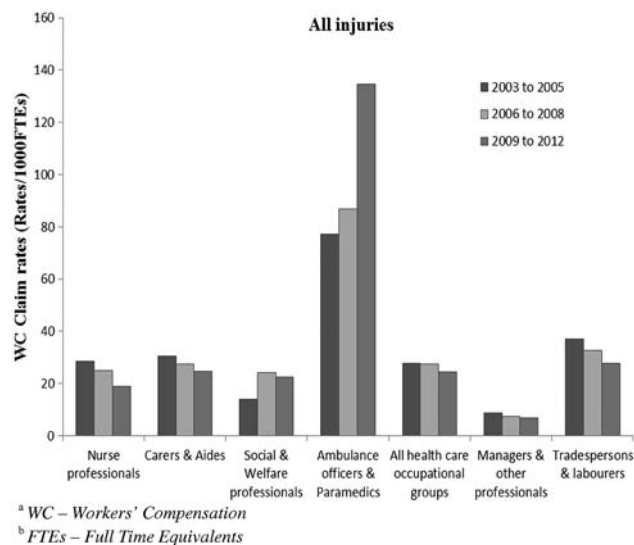


Figure 1 Workers' compensation claim rates for all injuries among selected occupational groups and all healthcare occupational groups in Victoria, Australia, over three time periods. FTEs, full time equivalents; WC, workers' compensation.

by nurse professionals in 2003–2005 and 2009–2012, respectively. Among social and welfare professionals, after an initial increase WC claim rates remained relatively steady. Nurse

professionals and carers and aides had similar WC claim rates, which decreased from approximately 30/1000 FTEs in 2003–2005, to 20/1000 FTEs in 2009–2012. The WC claim rates for all healthcare workers combined was also similar to the claim rates for nurse professionals, though the decline was smaller, from around 28/1000 FTEs in the initial time periods, to 24/1000 FTEs in 2009–2012.

Table 2 displays the HRs for injury risk by occupational groups across three time periods. Among the majority of occupational groups the HRs were around twofold higher for MSK injury compared with mental injury, whereas the difference in risk between lower back and upper limb MSK injury was approximately 1.5-fold or less. In general, injury risk was highest during 2006–2008 and lowest during 2009–2012. Ambulance officers and paramedics had the highest HRs for all injury types, and their risk of injury increased over the study period. Ambulance officers and paramedics had between 3.5 and 13 times the risk of lower back MSK injury as nurse professionals (21.5 vs 6.0 in 2003–2005, and 57.6 vs 4.4 in 2009–2012), and the difference in risk was similar for mental injury (7.17 vs 1.58 and 17.77 vs 1.29) during the corresponding time period. Nurse professionals had similar HRs for lower back MSK injury as tradespersons, and comparable risks overall for all injury categories as carers and aides. Social and welfare workers had the second highest HRs for mental injury across all three time periods. During 2003–2005, social and welfare professionals had around 1.5 times the risk of mental injury as

Table 2 Age and gender-adjusted HRs for risk of injury categories by six occupational groups in Victoria, Australia, over three time periods

Injury occupational group	Time period					
	2003–2005		2006–2008		2009–2012	
HR (95% CI)						
All MSK						
Nurse professionals	3.66	(3.49 to 3.83)	3.81	(3.63 to 3.99)	2.98	(2.85 to 3.11)
Ambulance officers and paramedics	13.38	(12.15 to 14.72)	17.54	(16.04 to 19.18)	29.97	(28.05 to 32.01)
Carers and aides	3.94	(3.77 to 4.12)	4.32	(4.13 to 4.52)	3.84	(3.70 to 3.99)
Social and welfare professionals	1.16	(1.04 to 1.30)	2.59	(2.41 to 2.79)	2.76	(2.60 to 2.94)
Tradespersons and labourers	5.21	(5.09 to 5.34)	5.32	(5.18 to 5.45)	4.87	(4.76 to 4.98)
Managers and other professionals	1.00	Ref	1.00	Ref	1.00	Ref
Lower back MSK						
Nurse professionals	6.01	(5.56 to 6.50)	5.62	(5.15 to 6.14)	4.42	(4.07 to 4.81)
Ambulance officers and paramedics	21.50	(18.63 to 24.82)	29.41	(25.52 to 33.89)	57.60	(52.01 to 63.78)
Carers and aides	5.70	(5.26 to 6.18)	6.37	(5.86 to 6.92)	5.53	(5.15 to 5.95)
Social and welfare professionals	1.23	(0.99 to 1.53)	3.17	(2.76 to 3.65)	3.52	(3.13 to 3.96)
Tradespersons and labourers	5.43	(5.19 to 5.69)	5.80	(5.52 to 6.10)	5.42	(5.18 to 5.67)
Managers and other professionals	1.00	Ref	1.00	Ref	1.00	Ref
Upper limb MSK						
Nurse professionals	3.97	(3.63 to 4.33)	4.58	(4.19 to 5.01)	3.47	(3.19 to 3.76)
Ambulance officers and paramedics	13.27	(10.70 to 16.46)	17.61	(14.50 to 21.39)	35.30	(31.06 to 40.12)
Carers and aides	3.99	(3.65 to 4.36)	4.57	(4.18 to 5.00)	4.02	(3.73 to 4.32)
Social and welfare professionals	1.17	(0.94 to 1.47)	2.91	(2.52 to 3.36)	3.06	(2.73 to 3.44)
Tradespersons and labourers	5.90	(5.61 to 6.21)	6.03	(5.72 to 6.36)	5.38	(5.14 to 5.63)
Managers and other professionals	1.00	Ref	1.00	Ref	1.00	Ref
Mental						
Nurse professionals	1.58	(1.43 to 1.74)	1.61	(1.45 to 1.80)	1.29	(1.17 to 1.42)
Ambulance officers and paramedics	7.17	(5.73 to 8.97)	8.92	(7.19 to 11.07)	17.77	(15.31 to 20.63)
Carers and aides	1.73	(1.57 to 1.91)	1.72	(1.55 to 1.91)	1.53	(1.41 to 1.67)
Social and welfare professionals	2.67	(2.37 to 3.02)	4.98	(4.55 to 5.45)	4.08	(3.76 to 4.42)
Tradespersons and labourers	0.95	(0.89 to 1.01)	0.90	(0.84 to 0.96)	1.05	(0.99 to 1.12)
Managers and other professionals	1.00	Ref	1.00	Ref	1.00	Ref

MSK, musculoskeletal; Ref, reference group.

nurse professionals (and carers and aides), and the risk was over threefold higher during the latter time periods.

DISCUSSION

The findings of this study suggest differential occupational injury patterns and trends among selected direct patient care occupational groups in Victoria, Australia, between 2003 and 2012. Ambulance officers and paramedics had an upward trend in WC claim rates for all injuries, which was in contrast to the small decline or stable rates observed among other occupational groups and all healthcare workers combined, over the 9-year study period. Ambulance officers and paramedics also had the highest risks for MSK and mental injury, which was up to 13 times greater than in nurses. Social and welfare workers had the second highest HRs for mental injury, and the relative risk increased over time.

The fivefold difference in WC claim rates (for all injuries) between ambulance officers and paramedics and the other healthcare occupational groups is similar to the findings by Maguire *et al*,¹⁴ who showed that Australian paramedics had over seven times the risk of serious injury as all other workers. However, WC claim rates varied and showed a less marked increase over their 10-year observation period. In addition, the authors examined overall occupational injury and fatality rates for paramedics only, whereas we compared risks of specific injury types among ambulance personnel and other healthcare workers with comparable job requirements. To the best of our knowledge, occupational injury risks for social and welfare workers using WC claims has also not been previously explored, and thus precludes comparisons with our study. On the other hand, the downward trend in WC claim rates (and therefore injury risk) observed among all healthcare occupational groups in our study has been previously reported.^{4–8}

One of the few studies that compared trends for specific MSK and mental injuries was the recent research by Carder *et al*.²¹ Between 1996 and 2009, the decline for upper limb and spine/back conditions within the UK health and social care sector also mirrored the trend in annual incidence for total MSK disorders. The authors suggested that the pattern could be partly explained by patients presenting and reporting physical symptoms as psychological problems due to reduced stigma with mental injury (which increased in incidence over their study timeframe). Caution is required, however, when making comparisons with this study as work-related injury data were derived from The Health and Occupation Research (THOR) network rather than WC claims database. THOR is a UK-based occupational surveillance scheme that utilises incident cases reported by specialist physicians to estimate occupational injury and disease incidence in the UK workforce. In addition, Carder *et al* focused on the overall health and social care industry rather than specific healthcare occupational groups.

In any case, explanation(s) for the observed decrease in risk for MSK injury among some of the direct patient care occupational groups in our study would be speculative given the observational nature of our data. While Yassi *et al*⁴ noted that the decline in national time-loss injury rates in their study coincided with the introduction of the 'No lift' and other health and safety (OHS) initiatives, current consensus is that assistive devices with (or without) advice and training do not prevent back pain and back pain-related disability.²² There is also a paucity of evidence-based OHS interventions to prevent upper limb MSK injuries.²³ Instead the reduction in WC claims is thought in part to be a result of secondary preventive measures that focus on active rehabilitation and early return to work.

The high (and increasing) risk of MSK injury among ambulance officers and paramedics in the present study may be the result of fewer opportunities for modified duties in the return to work process. Ambulance officers and paramedics had over three times the risk of MSK injury compared with nurse professionals (or carers and aides) throughout the study period, and the difference was up to 13 times greater for lower back MSK injury. Unique workplace hazards have been implicated in the health problems experienced by this group. Heavy, repetitive manual handling involving patients and equipment are characteristic of direct patient care work, but the risks are compounded by being performed in uncontrolled and at times cramped work spaces in the case of ambulance personnel.^{15 16} The increasing risk of MSK injury could also be attributed to their wider scope of practice, increased workload, and higher patient body mass index. Besides, occupational risk reduction and prevention strategies for MSK injury pose challenges to implement in primary care emergency response settings.²⁴

Ambulance officers and paramedics also had the highest risks for mental injury. Their risk of mental injury was 4.5 to 14-fold higher than nurse professionals. Furthermore, their HR for mental injury more than doubled over the 9-year study period, from 7.17 in 2003–2005 to 17.7 in 2009–2012. Social and welfare professionals had the second highest HRs for mental injury, and up to three times the risk of mental injury as nurse professionals.

As previously mentioned, Carder *et al*²¹ observed an increase in reported mental ill-health among UK health and social care workers, which was the opposite of the trend observed for a majority of the direct patient care occupational groups in our study. Similarly, Foley and Rauser²⁵ observed a reduction in WC claim rates for workplace violence (a risk factor for mental injury) across all industries in Washington State between 1997 and 2007. However, the healthcare and social assistance sector had the highest rates among all industries each year, and healthcare occupational groups (including counsellors) ranked among the top 10 occupations with the highest WC claim rates for workplace violence.

Mental health problems, in particular occupational stress and burnout are well documented in the social and welfare profession.^{18 26 27} These conditions have been attributed to personal and significant responsibility for the welfare of vulnerable population groups, and work organisational factors including high workload with limited resources and time pressures. Ambulance officers and paramedics are also occupationally exposed to psychological hazards. As emergency primary care providers they often attend tragic and gruesome events, deal with violence and other threats to personal safety regularly, and are increasingly expected to perform under time constraints. Mental health disorders, such as post-traumatic stress disorders, have been reported to be higher in the ambulance services compared with the general population,¹⁵ and other emergency services personnel.²⁸

The findings of high mental injury risk among ambulance personnel and social and welfare workers may also be explained by the lack of support and buffer against occupational mental stress and its effects offered in team-based work environments, as occurs among nurses. Preventive OHS interventions akin to the 'no lift' strategy for MSK disorders are also not as well-established for mental injury.²⁹ Moreover, research to-date that have evaluated these interventions have typically involved nurses only, and been based in hospital settings. Nonetheless, our findings of significant occupational injury risks have important implications for prevention. As well as identifying a gap in

knowledge about injury trends and patterns among some direct patient care occupational groups, this study has also highlighted the need for further research that focusses on the circumstances of occupational injury, especially among ambulance personnel, to improve understanding of our findings and subsequently inform prevention programmes.

Our study has several strengths. First of all, inclusion of several healthcare occupational groups enabled detailed review of the broader healthcare sector. For example, the different trend in WC claim rates and injury risks identified for ambulance personnel could have been overlooked if we had focused on just the overall industry, or a few occupational groups. Second, examination of common and arguably the most important work-related conditions, MSK and mental injury, provided a better perspective of their relative significance. Third, analysis of WC claim rates over an extended and recent period illustrated trends and patterns and provided an up-to-date picture. Above all, the focus on a hitherto under-researched aspect of injury trends and risk among healthcare workers, in particular ambulance officers and paramedics who are a poorly researched occupational group, has contributed to existing knowledge.

The results of this study should also be interpreted given the following limitations. WC claims statistics are not collected primarily for research purposes. They likely underestimate the magnitude of work-related conditions as they capture accepted claims for reported injuries, and only by workers covered by the insurance schemes.^{30 31} This is unlikely to have influenced our results markedly as almost all employees in the healthcare and community services industry are eligible for WC.

The denominator data, in particular for small occupational groups such as ambulance officers and paramedics were quite variable over time. The use of variable denominator estimates has limitations, however, the SafeWork Australia database is the only available source of information about ambulance officers and paramedic workforce size, stratified by age group and gender. The estimates provided by Safe Work Australia were similar to those of the Australian LFS. Additionally, to reduce yearly fluctuations we examined risk of injury across the occupational groups within 3-year to 4-year windows. While WC claim rates among ambulance officers and paramedics may have been over-estimated as a result of under-estimating the ambulance personnel workforce size relative to other occupational groups in our study, it is unlikely to have resulted from over-estimating their number of claims as we used a census of all claims submitted to the VWA.

CONCLUSION

WC claim rates among several direct patient care occupational groups and all healthcare workers combined, declined between 2003 and 2012. This study also confirmed that WC claim (and therefore incidence) rates were highest for lower back MSK injury, but revealed appreciable rates for upper limb MSK and mental injury. Importantly, ambulance officers and paramedics had the highest risks overall for mental and MSK injury, and an upward trend in WC claim rates over the 9-year study period. Further research that focuses on the circumstances of injury among similar healthcare occupational groups is warranted, to clarify and improve understanding of our findings and subsequently inform prevention programmes.

Acknowledgements The authors are grateful to the Institute for Safety, Compensation and Recovery Research (ISCRR) at Monash University for access to and provision of data from the Compensation Research Database (CRD).

Contributors MHR had the original idea for the study, interpreted the data, and drafted and revised the manuscript. MRS contributed ideas to the study design and edited the manuscript. OB contributed to data analysis and edited the manuscript. PS contributed ideas to the study design, analysed and interpreted the data and revised the manuscript.

Funding MHR was supported by a Royal Australasian College of Physician (RACP) Australasian Faculty of Occupational and Environmental Medicine (AFOEM) Research Development Scholarship from the RACP Foundation. PS received a Discovery Early Career Researcher Award (DECRA) from the Australian Research Council (ARC). OB was supported by a PhD scholarship from an ARC linkage grant.

Competing interests None.

Ethics approval Monash University Human Research Ethics Committee

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- International Labour Organisation (ILO). *Health care: its nature and its occupational health problems*. 4th edn. Geneva: International Labour Organisation, 1998. ILO Encyclopaedia of Occupational Health and Safety.
- Fronteira I, Ferrinho P. Do nurses have a different physical health profile? A systematic review of experimental and observational studies on nurses' physical health. *J Clin Nurs* 2010;20:2404–24.
- Collins JW, Bell JL, Gronqvist R. Developing evidence-based interventions to address the leading causes of workers' compensation among healthcare workers. *Rehabil Nurs* 2010;35:225–61.
- Yassi A, Gilbert M, Cvitkovich Y. Trends in injuries, illnesses, and policies in Canadian healthcare workplaces. *Can J Public Health* 2005;96:333–9.
- Rodriguez-Acosta RL, Richardson DB, Lipscomb HJ, et al. Occupational injuries among Aides and nurses in acute care. *Am J Ind Med* 2009;52:953–64.
- Pompeii LA, Lipscomb HJ, Dement JM. Surveillance of musculoskeletal injuries and disorders in a diverse cohort of workers at a tertiary care medical center. *Am J Ind Med* 2008;51:344–56.
- Howard NH, Adams D. An analysis of injuries among home health care workers using the Washington State workers' compensation claims database. *Health Care Serv Q* 2010;29:55–74.
- Khuder SA, Schaub EA, Bisesi MS, et al. Injuries and illnesses among hospital workers in Ohio: a study of workers' compensation claims from 1993 to 1996. *J Occup Environ Med* 1999;41:53–9.
- da Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: a systematic review of recent longitudinal studies. *Am J Ind Med* 2010;53:285–323.
- Safe Work Australia. *Occupational disease indicators*. Canberra: Safe Work Australia, 2012.
- Guthrie R. The Australian legal framework for stress claims. *J Law Med* 2007;14:528–50.
- Waehrer G, Leigh JP, Miller TR. The health of health workers—costs of occupational injury and illness within the health services sector. *Int J Health Serv* 2005;35:343–59.
- Zechinatti AC, Bellotti JC, de Moraes VY, et al. Occupational musculoskeletal and mental disorders as the most frequent associations to worker's sickness absence: a 10-year cohort study. *BMC Res Notes* 2012;5:229.
- Maguire BJ, O'Meara PF, Brightwell RF, et al. Occupational injury risk among Australian paramedics: an analysis of national data. *Med J Aust* 2014;200:477–80.
- Sterud T, Ekeberg O, Hem E. Health status in the ambulance services: a systematic review. *BMC Health Serv Res* 2006;6:82.
- Broniecki M, Esterman A, May E, et al. Musculoskeletal disorder prevalence and risk factors in ambulance officers. *J Back Musculoskeletal Rehabil* 2010;23:165–74.
- Mildenhall J. Occupational stress, paramedic informal coping strategies: a review of the literature. *J Paramedic Pract* 2012;4:318–28.
- Keegel T, Ostry A, LaMontagne AD. Job strain exposures vs. stress-related workers' compensation claims in Victoria, Australia: Developing a public health response to job stress. *J Public Health Policy* 2009;30:17–39.
- Breslin C, Koehoorn M, Smith P, et al. Age related differences in work injuries and permanent impairment: a comparison of workers' compensation claims among adolescents, young adults, and adults. *Occup Environ Med* 2003;60:E10.
- The SAS Institute. *The SAS System for Windows*, Release 9.3. Cary, NC, 2011.
- Carder M, McNamee R, Turner S, et al. Time trends in the incidence of work-related mental ill-health and musculoskeletal disorders in the UK. *Occup Environ Med* 2013;70:317–24.
- Verbeek JH, Martimo KP, Karpinnen J, et al. Manual material handling advice and assistive devices for preventing and treating back pain in workers. *Cochrane Database of Syst Rev* 2011;(6):CD005958.
- Kennedy CA, Amick BC III, Dennerlein JT, et al. Systematic review of the role of occupational health and safety interventions in the prevention of upper extremity musculoskeletal symptoms, signs, disorders, injuries, claims and lost time. *J Occup Rehabil* 2010;20:127–62.

- 24 Ferreira J, Stanley L. Evaluation of manual handling tasks involving the use of carry chairs by UK ambulance personnel. UK: Health and Safety Executive (HSE), 2005, Research Report 314.
- 25 Foley M, Rauser E. Evaluating progress in reducing workplace violence: trends in Washington State workers' compensation claims rates, 1997–2007. *Work* 2012;42:67–81.
- 26 Lloyd C, King R, Chenoweth L. Social work, stress and burnout. *J Ment Health* 2002;11:255–65.
- 27 Dollard MF, LaMontague AD, Caulfield N, *et al.* Job stress in the Australian and international health and community services sector: a review of the literature. *Int J Stress Manag* 2007;14:417–45.
- 28 Skogstad M, Skorstad M, Lie A, *et al.* Work-related post-traumatic stress disorder. *Occup Med* 2013;63:175–82.
- 29 Routsalainen J, Serra C, Marine A, *et al.* Systematic review of interventions for reducing occupational stress in health care workers. *Scand J Work Environ Health* 2008;34:169–78.
- 30 Pransky G, Snyder T, Dembe A, *et al.* Under-reporting of work-related disorders in the workplace: a case study and review of the literature. *Ergon* 1999;42: 171–82.
- 31 Azaroff LS, Levenstein C, Wegman DH. Occupational injury and illness surveillance: conceptual filters explain underreporting. *Am J Public Health* 2002;92: 1421–9.



Occupational injury risk among ambulance officers and paramedics compared with other healthcare workers in Victoria, Australia: analysis of workers' compensation claims from 2003 to 2012

Minainyo Helen Roberts, Malcolm Ross Sim, Ollie Black and Peter Smith

Occup Environ Med published online March 16, 2015

Updated information and services can be found at:

<http://oem.bmj.com/content/early/2015/03/16/oemed-2014-102574>

These include:

Supplementary Material

Supplementary material can be found at:

<http://oem.bmj.com/content/suppl/2015/03/16/oemed-2014-102574.DC1.html>

References

This article cites 26 articles, 3 of which you can access for free at:

<http://oem.bmj.com/content/early/2015/03/16/oemed-2014-102574#BIBL>

Email alerting service

Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Notes

To request permissions go to:

<http://group.bmj.com/group/rights-licensing/permissions>

To order reprints go to:

<http://journals.bmj.com/cgi/reprintform>

To subscribe to BMJ go to:

<http://group.bmj.com/subscribe/>