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Journal articles marked with an asterisk indicate an IWH scientist or adjunct scientist is included in the list of authors.

***Amberson T, Graves JM, and Sears JM. Implementing the Total Worker Health program in a shared governance context. *Journal of Emergency Nursing*. 2022; 48(4):342-347.**
<https://doi.org/10.1016/j.jen.2022.05.004>

***Dobson KG, Mustard C, Carnide N, Furlan A, and Smith PM. Impact of persistent pain symptoms on work absence, health status and employment 18 months following disabling work-related injury or illness. *Occupational and Environmental Medicine*. 2022; [epub ahead of print].**
<https://doi.org/10.1136/oemed-2022-108383> [open access]

Abstract: Objectives: While most individuals physically injured at work will make a complete medical recovery, a portion of workers will experience persistent pain following their injury. This study estimated persistent pain prevalence and its association with health and return-to-work outcomes 18 months following the incidence of a disabling work-related injury. **Methods:** We studied 1131 workers disabled by a work-related injury who were recruited from a sampling frame of disability benefit claimants in Ontario, Canada. Work injuries and claim benefits characteristics from administrative data were linked with measures of work status, pain symptoms, and physical and mental health obtained from telephone interviews completed 18 months postinjury. Associations of persistent pain symptoms with health and employment outcomes 18 months postinjury were estimated using multinomial and linear regression. **Results:** Roughly 30% of participants reported no pain symptoms in the previous 4

weeks, 45% reported mild pain symptoms and 25% reported severe pain symptoms accompanied by substantial functional impairment. Workers with severe pain symptoms were more likely to not be currently working at 18 months (33%) vs those without pain symptoms (16%), and had poorer self-reported physical and mental health. Workers with severe pain symptoms had higher probabilities of benefit durations of 12-18 months (OR=9.35), higher lost-earnings costs (~47.7% higher) and higher healthcare expenditure costs at 18 months (~125.9% higher) compared with those with no pain symptoms. Conclusions: Persistent pain symptom prevalence 18 months postinjury is high among workers disabled by a work-related injury and associated with substantial functional impairment and longer wage replacement benefit duration.

Afolabi FJ. "We can regulate ourselves": exploring the artisans' trade associations' contributions to occupational safety and health problem prevention. *Safety Science*. 2022; 154:105836.

<https://doi.org/10.1016/j.ssci.2022.105836>

Carr-Pries NJ, Killip SC, and MacDermid JC. Scoping review of the occurrence and characteristics of firefighter exercise and training injuries. *International Archives of Occupational & Environmental Health*. 2022; 95(5):909-925.

<https://doi.org/10.1007/s00420-022-01847-7>

Abstract: OBJECTIVES: To summarize the current research on the occurrence of firefighter exercise and training injuries and to describe the nature of these injuries. METHODS: Scoping review methods were used to identify articles and extract information relevant to firefighter exercise and training injuries. Relevant articles were identified from MEDLINE, Web of Science, CINAHL, Embase, PubMed, and through hand-searching. RESULTS: A total of 1053 articles were identified, and 23 met the inclusion criteria. Nine studies were retrospective analyses of injury data, 13 studies used surveys to identify injuries in the past year, and 1 study reviewed U.S. firefighter injury reports. Three studies included both career and volunteer firefighters, 2 studies included career firefighters, 2 studies include volunteer firefighters, 1 study include recruits and 16 studies did not specify the career status. The occurrence of exercise and training injuries from 22 of the 23 studies ranged from 8.1 to 55.3% of reported injuries. One study found that 3 out of 15 fire departments identified exercise and training as the most common cause of their firefighter injuries. The 13 articles that reported the type of injuries identified musculoskeletal disorders as the most common type of injury (32% to 79% of reported injuries). The ankle, knee and leg were identified as the most commonly injured areas of the body. CONCLUSIONS: Training injuries are common in firefighters and must be prevented. Future research is needed to identify root causes of training injuries to guide prevention strategies

Caxaj S, Tran M, Mayell S, Tew M, McLaughlin J, Rawal S, et al. Migrant agricultural workers' deaths in Ontario from January 2020 to June 2021: a qualitative descriptive study. *International Journal for Equity in Health*. 2022; 21(1):98.

<https://doi.org/10.1186/s12939-022-01692-7> [open access]

Abstract: BACKGROUND: Nine migrant agricultural workers died in Ontario, Canada, between January 2020 and June 2021. METHODS: To better understand the factors that contributed to the deaths of these migrant agricultural workers, we used a modified qualitative descriptive approach. A research team of clinical and academic experts reviewed coroner files of the nine deceased workers and undertook an accompanying media scan. A minimum of two reviewers read each file using a standardized data extraction tool. RESULTS: We identified four domains of risk, each of which encompassed various factors that likely exacerbated the risk of poor health outcomes: (1) recruitment and travel risks; (2) missed steps and substandard conditions of healthcare monitoring, quarantine, and isolation; (3) barriers to accessing healthcare; and (4) missing information and broader issues of concern. CONCLUSION: Migrant agricultural workers have been disproportionately harmed by the COVID-19 pandemic. Greater attention to the unique needs of this population is required to avoid further preventable deaths

Diaz-Benito VJ, Moro MIB, Vanderhaegen F, Remon ALC, Lozano JAS, Fernandez-Pola EC, et al. Intervention of physical exercise in the workplace on work ability, depression, anxiety and job satisfaction in workers with sedentary tasks. *Work*. 2022; 72(3):921-931.

<https://doi.org/10.3233/WOR-210300>

Abstract: Background: Sedentary tasks contribute to the deterioration of health and the appearance of chronic diseases. Physical exercise can contribute to the development of health, although the characteristics of the most appropriate program are unknown. Objectives: This is the second paper of the PRODET[®] intervention trial evaluating the effect of a supervised group exercise intervention in the worksite based on aerobic capacity and strength lasting 12 weeks. Methods: The sample was composed of 67 subjects (N = 67, mean age 34.31 years) and the study investigated a 12-week group physical exercise program in the workplace, two days per week with 50-minute sessions, which was supervised and based on aerobic endurance and strength. The 67 subjects were working-age office workers, deemed as sedentary and randomized into an intervention (N = 40) or control (N = 27) group. Outcomes work ability, depression, anxiety and job satisfaction were assessed with questionnaires pre-and post-test in both groups. Results: The program showed effects on the mental factor of work ability (Z = 2.36, P = 0.019, $\eta^2 = 0.09$). However, there were no significant differences in the rest of the results. Conclusions: The intervention had an impact on the mental factor of work ability in the workers whose occupations were based on sedentary tasks, and reinforcing this variable with an exercise program in the workplace could contribute to reducing the mental factor of work ability.

Du BB, Yung M, Gruber J, and Yazdani A. Organizational strategies to address posttraumatic stress injuries among Canadian paramedics. *Work*. 2022; 72(3):1035-1045.

<https://doi.org/10.3233/WOR-210614>

Abstract: BACKGROUND: Paramedics are a high-risk occupational group for posttraumatic stress injuries (PTSI), and increasingly, evidence suggests that organizational factors play a significant role. While several resources for paramedic services to address PTSI exist, there is limited knowledge as to which PTSI-related programs and practices are implemented and how they are perceived in the workplace. OBJECTIVES: This research aimed to explore key informants' perspectives on existing and desired organizational-wide initiatives for, as well as the challenges and potential solutions to, the primary prevention, early detection and intervention, and disability management of PTSI in Canadian paramedic services. METHODS: Semi-structured interviews were conducted with 12 key informants from jurisdictions across Canada who have over five years of work experience in prehospital care. Interviews were audio-recorded, transcribed, and analyzed using thematic analysis. RESULTS: Eight recurrent organizational elements (themes) for addressing PTSI emerged: psychologically safe and healthy work culture; consistent supervisor support, mental health training and awareness, opportunities for recovery and maintaining resiliency, recognition of PTSI and its diverse risk factors, access to a variety of support initiatives for PTSI, communication during medical leave, and meaningful work accommodations. CONCLUSIONS: While organizational-wide initiatives were in place for the primary prevention, early detection and intervention, and disability management of PTSI, systemic challenges with coordination, resource allocation, and worker engagement were also identified. These challenges prevented paramedic services from optimally addressing PTSI in their workplace. Integrating considerations from the eight organizational elements to address PTSI into broader existing management systems may have merit in overcoming the systemic challenges

Gopalkrishnan S, Ramachandran S, Ring D, Melhorn JM, and Crijns TJ. Potential misinformation in the official disability guidelines about the diagnosis and treatment of carpal tunnel syndrome. *Journal of Occupational & Environmental Medicine*. 2022; 64(7):e424-e430.

<https://doi.org/10.1097/JOM.0000000000002570>

Abstract: OBJECTIVE: Workers' compensation guidelines may reinforce unhelpful thoughts regarding symptoms that are known to increase symptom intensity and magnitude of incapability. METHODS: One guideline commonly used (the Official Disability Guidelines) was reviewed regarding carpal tunnel syndrome. For 15 statements, we created an alternative statement based on a set of consensus principles for health, value, and quality in care. One hundred eight upper extremity surgeons of the Science of Variation Group reviewed both versions of the statements to indicate their preference. RESULTS: Surgeons preferred seven revised statements and five guideline statements and were neutral on three statements. Favored revisions related to more accurate discernment of symptoms that are clearly related to idiopathic median neuropathy and representative of severity of pathology. CONCLUSIONS:

There may be important mental health considerations for care under a work claim, such as unhelpful thoughts or distress regarding symptoms, which are not adequately considered by the Official Disability Guidelines

Hammond S, Hallman MG, Bowen P, Combs B, and Heaton K. Returning to work after an orthopaedic injury. *Orthopedic Nursing*. 2022; 41(3):198-202.

<https://doi.org/10.1097/NOR.0000000000000849>

Abstract: Workers' compensation and orthopaedic nursing are often intertwined for the treatment of an injured worker and returning them to work. The workers' compensation system can be complex, and knowing the regulations can be beneficial in the treatment of an injured worker and returning them to work safely. Orthopaedic nurses often play an integral role in the evaluation, treatment, and discharge of an injured worker, so understanding workers' compensation, workers' job, and expectations is important for the safe return of a worker back to duty. Orthopaedic nurses are in key positions to assist with the planning, treatment, and return of a worker back to their job

Klepo I, Sangster JC, and Trsinski D. The role of occupational participation for people with traumatic brain injury: a systematic review of the literature. *Disability and Rehabilitation*. 2022; 44(13):2988-3001.

<https://doi.org/10.1080/09638288.2020.1858351>

Abstract: Purpose: Improving participation and quality of life is a desirable goal following traumatic brain injury (TBI). The purpose of this systematic review was to summarize existing findings concerning the role of occupational participation for persons with TBI. Methods: A systematic literature search using four electronic databases was followed by a review of all titles and abstracts. Articles were included if the studies were conducted with adults with TBI, used a qualitative methodology and explored the role or meaning of occupations and occupational participation from the perspectives of individuals with TBI. Following data extraction, a thematic synthesis was conducted. Results: A total of 642 articles were identified, of which 14 met all inclusion criteria. Three themes related to the role of occupations for people with TBI emerged: reflecting on change in occupational performance and occupational participation, occupational adaptation, and individual meaning of occupational participation. Conclusion: The findings demonstrate the significance of occupational participation for people following TBI. Occupational participation enabled better understanding of one's abilities and limitations, assisted in occupational adaptation, and held unique meaning for participants. The findings also highlight the importance of providing long-term services focused on enabling participation in occupations in order to ensure successful adaptation following TBI. Implications for rehabilitation for persons with TBI, occupational participation enables recognition of changes in their performance, contributes to the process of adaptation and identity (re)construction, fulfils various intrinsic needs and provides a sense of personal meaning. Rehabilitation professionals should recognize persons with TBI as occupational beings and work with individuals to identify the

meaning of important occupations in the process of understanding and adapting to changes in capability, performance and participation. The rehabilitation process should focus on enabling persons to perform and participate in the occupations they want, need or are expected to do in their daily lives. National and regional health care systems should ensure that persons with TBI are provided with appropriate physical, social and institutional support and services in order to achieve meaningful occupational engagement.

Lenander-Ramirez A, Bryngelsson IL, Vihlborg P, Westberg H, and Andersson L. Respirable dust and silica: respiratory diseases among Swedish iron foundry workers. *Journal of Occupational & Environmental Medicine*. 2022; 64(7):593-598.

<https://doi.org/10.1097/JOM.0000000000002533> [open access]

Abstract: OBJECTIVE: The mortality and morbidity pattern for respiratory diseases was determined in a cohort of 1752 Swedish foundry workers, particularly for respirable silica dust exposure. METHODS: The morbidity follow-up in the Swedish National Non-primary Outpatient Register covered 2001 to 2017 (NPR; specialist not in care patients), the mortality from the National Causes of Death Register covered 2001 to 2017. Cumulative exposures to silica and dust were determined. RESULTS: The morbidity in COPD showed significantly increased risk for all exposure groups, as did silicosis in the high exposure group, these cases corresponded to silica exposure levels below 0.05 mg/m³. The mortality of all causes and respiratory diseases was significantly increased by cumulative silica exposure in the high exposure group. CONCLUSIONS: Significantly increased morbidity for respiratory diseases and COPD was determined at silica exposure levels below the current Swedish OEL

Moon J. Missed reporting of nonfatal occupational injuries: estimation using the International Labor Organization datasets. *International Archives of Occupational & Environmental Health*. 2022; 95(6):1343-1356.

<https://doi.org/10.1007/s00420-022-01892-2>

Abstract: Introduction: Most previous studies about missed reporting of nonfatal occupational injuries have four limitations: (i) mostly qualitative methods, (ii) arbitrary fraction used to estimate missed nonfatal occupational injuries based on subjective opinions, (iii) use of datasets derived from only one country, and (iv) use of a relatively simple estimation method. In contrast, (i) using quantitative approaches, this study will calculate the (ii) objective estimates on (iii) a multinational scale. (iv) A newly devised logical approach for estimation will be applied. Through this study, the fraction of missed reports of nonfatal occupational injuries will be estimated in a new way. Methods: Four International Labor Organization (ILO) datasets were analyzed in this study: (i) fatal occupational injuries per 100,000 workers by sex and migrant status, (ii) nonfatal occupational injuries per 100,000 workers by sex and migrant status, (iii) inspectors per 10,000 employed persons, and (iv) labor inspection visits per inspector. The ratification status of 27 ILO conventions, classified into 12 categories, was used for the analyses. The GDP dataset from the World Bank Open Data was also used. In addition to basic descriptive analyses, a multilevel Poisson regression

method was applied. The primary outcome was the risk ratio of the above-mentioned four selected measures when an ILO convention was ratified compared to when the convention was not ratified. Finally, for the estimation of the fraction of missed reports of nonfatal occupational injuries, a newly devised estimation method was applied. This method was devised based on a unique characteristic of reporting systems for fatal occupational injuries (duplicate reporting through multiple reporting systems). Results: The ratio of discovered nonfatal occupational injuries to total estimated nonfatal occupational injuries ranged from 0.13 (95% CI 0.13-0.14) to 0.89 (95% CI 0.84-0.95). In other words, the minimum estimate of the percentage of missed injury reports is 11% ($1-0.89 = 0.11$) and the maximum is 87% ($1-0.13 = 0.87$). The mean value of the ratios of discovered nonfatal occupational injuries to total estimated nonfatal occupational injuries was 0.52. In other words, the most likely estimate for the fraction of missed injury reports is 48% ($1-0.52 = 0.48$). Discussion: Underreporting of nonfatal occupational injuries could hinder the efforts of governments to address and improve the occupational safety and health status of the country. Accurate assessment of the current status of nonfatal occupational injuries is important for devising effective strategies to reduce this type of injury.

Neri A, Cagno E, and Paredi S. The mutual interdependences between safety and operations: a systematic literature review. *Safety Science*. 2022; 153:105812.

<https://doi.org/10.1016/j.ssci.2022.105812>

Pagnotta M, Jacobs DM, de Frutos PL, Rodriguez R, Ibanez-Gijon J, and Travieso D. Task difficulty and physiological measures of mental workload in air traffic control: a scoping review. *Ergonomics*. 2022; 65(8):1095-1118.

<https://doi.org/10.1080/00140139.2021.2016998>

Abstract: This study provides a systematic synthesis of empirical research on mental workload (MWL) in air traffic control (ATC). MWL is a key concept in research on innovative technologies, because the assessment of MWL is crucial to the evaluation of such technologies. Our specific focus was on physiological measures of MWL. The used search strategy identified 39 peer-reviewed publications that analysed ATC tasks, examined different levels of difficulty of the ATC task, and considered at least one physiological measure of MWL. Positive relations between measures of MWL and task difficulty were observed most frequently, indicating that the measures indeed allowed the assessment of MWL. The most commonly used physiological measures were brain measures (EEG and fNIR) and heart rate measures. The review revealed a need for more precise descriptions of crucial experimental parameters in order to permit a transition of the field towards more interactive and dynamic types of analysis. Practitioner summary: Research on innovative technology in air traffic control (ATC) depends on assessments of mental workload (MWL). We reviewed empirical research on MWL in ATC. Brain and heart measures often allow assessments of MWL. Better

descriptions of experiments are needed to allow comparisons among studies and more dynamic and interactive analyses

Sritharan J, Kirkham TL, MacLeod J, Marjerrison N, Lau A, Dakouo M, et al. Cancer risk among firefighters and police in the Ontario workforce. *Occupational and Environmental Medicine*. 2022; 79(8):533-539.

<https://doi.org/10.1136/oemed-2021-108146> [open access]

Abstract: OBJECTIVE: Firefighters and police often work in high-stress, complex environments with known and suspected carcinogenic exposures. We aimed to characterise cancer incidence among firefighters and police. METHODS: The Occupational Disease Surveillance System (ODSS) was used to identify workers employed as firefighters or police in Ontario. A cohort of workers were identified using lost-time workers' compensation claims data and followed for cancer in the Ontario Cancer Registry (1983-2020). Cox proportional hazard models were used to estimate HRs and 95% CIs for primary site-specific cancer diagnoses adjusted for age at start of follow-up, birth year and sex. RESULTS: A total of 13 642 firefighters and 22 595 police were identified in the cohort. Compared with all other workers in the ODSS, firefighters and police had increased risk of prostate cancer (firefighters: HR=1.43, 95% CI 1.31 to 1.57; police: HR=1.47, 95% CI 1.35 to 1.59), colon cancer (firefighters: HR=1.39, 95% CI 1.19 to 1.63; police: HR=1.39, 95% CI 1.21 to 1.60) and skin melanoma (firefighters: HR=2.38, 95% CI 1.99 to 2.84; police: HR=2.27, 95% CI 1.96 to 2.62). Firefighters also had increased risk of cancer of the pancreas, testis and kidney, as well as non-Hodgkin's lymphoma and leukaemia. Police had increased risk of thyroid, bladder and female breast cancer. When compared directly with the police, firefighters had an elevated risk of mesothelioma and testicular cancer. CONCLUSIONS: Firefighters and police demonstrated some similar as well as some unique cancer risks. Findings from this larger worker population may have important implications for workplace and policy-level changes to improve preventative measures and reduce potential exposures to known carcinogenic hazards

Wurzelbacher SJ, Bertke SJ, Lampl MP, Bushnell PT, Robins DC, Naber SJ, et al. The impact of a state-based workers' compensation insurer's risk control services on employer claim frequency and cost rates. *Journal of Occupational & Environmental Medicine*. 2022; 64(7):562-572.

<https://doi.org/10.1097/JOM.0000000000002508> [open access]

Abstract: OBJECTIVE: This study evaluated the impact of a state workers' compensation (WC) insurer's onsite risk control (RC) services on insured employers' WC claim frequency and cost. METHODS: We used two methods to model 2004 to 2017 claims data from 4606 employers that received RC visits over time and compare this claims experience to matching employers that did not receive RC services. RESULTS: Relative total WC claim rates increased slightly after RC services, while relative lost-time claims rates either remained similar or decreased and WC cost rates decreased. The impact of RC services on reducing WC costs was

cumulative up to the fourth visit but diminished thereafter. CONCLUSIONS: The insurer RC consultation program was effective in reducing WC cost rates for serviced employers. This is consistent with other research conducted on insurer RC services and related regulatory visits

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