Abstracts

Poster Presentation

Exposure assessment

0211 OCCUPATIONAL HEAT STRESS AND HEAT STRAIN ASSESSMENT USING CLIMATE SERVICE INFORMATION

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Global warming will unquestionably increase the impact of heat on individuals. The increasing prevalence of this environmental health risk requires the improvement of exposure assessment linked to meteorological data. Reliable assessments of heat stress and heat strain will help to reveal the size of the problem and design appropriate interventions at individual, workplace and societal level. However, it is common that air temperature is widely used as a single parameter in epidemiological studies on the effect of health. The evaluation of occupational heat stress requires measurement of four thermal climate factors (air temperature, humidity, air velocity and heat radiation); available weather station data may serve this purpose. However, the use of meteorological data for such assessment is limited because weather stations do not traditionally and directly measure some important climate factors, e.g. solar radiation. In addition, local workplace environmental conditions such as local heat sources, physical workload related metabolic heat production within the human body, and clothing properties, all affect the exchange of heat between the body and the environment. A robust occupational heat stress and heat strain index should properly address all these factors. This article reviews and highlights a number of national heat stress and heat strain indices including Wet Bulb Globe Temperature, Discomfort Index, Predicted Heat Strain index, and Universal Thermal Climate Index. Relevant preventive strategies for alleviating heat strain are proposed.

Oral Presentation

Exposure assessment

0289 ‘DAVID’S CHEESE BREAD’ METHOD: WORKLOAD QUANTITATIVE EXPOSURE THRESHOLDS DETECTION USING ADJUSTED HAZARD MULTIVARIATE PARAMETRIC MODELLING, USEFUL INCUMULATIVE TRAUMA DISORDERS PREVENTION AND WITHIN THEIR CAUSAL ASSESSMENT

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Background Qualitative methods are frequently used for workload assessment due to their relative low-cost but their evidence lack, high subjectivity and inaccurate conclusions lead to develop quantitative evidence-based methods for Cumulative Trauma Disorders evaluation. This research aims to generate robust and reliable evidence useful in prevention systems and within workers’ compensation processes (causal assessment) by measuring cumulative effective working time to define suitable exposure thresholds.

Methods A retrospective cohort study was assembled with workers from different positions. Inclusion/exclusion criteria were rigorously applied to finally accept 328 workers (656 shoulders). Entire clinic history was analyzed towards obtaining important clinical variables. Each shoulder workload was assessed independently getting cumulative exposure time to movement angles, repetitive motions, load lifting, exertion and vibration, adjusting by rest/break periods and other important covariates, controlling confusing effects. The exposure thresholds were obtained using an adjusted multivariate Weibull regression modeling. Huber’s M-estimator was used warranting robustestimators to correct both shoulders non-completely independent measures. Final model was built according with Hosmer-Lemeshow-May’s covariates purposeful selection principles.

Findings/conclusions Within the adjusted multivariate final model, we could set hazard rate ratio (HRR) into five different clusters across cohort exposure time-line: ‘D’ or baseline hazard zone; ‘a’ zone (HRR=1; p-value≥0.05); ‘v’ or risk zone (HRR>1; p-value<0.05); ‘i’ or survivors zone (HRR≈1; p-value≈0.05); and ‘d’ or super-survivors zone (HRR<1; p-value<0.05). Shortest cumulative times within ‘v’ zone were selected as exposure thresholds. For workload factors, we were able to clearly define zones and thresholds. We’ve also named ‘v’ cluster as ‘cheese’ zone and others as ‘no-cheese’ areas.

Oral Presentation

Respiratory

0413 SHORT-TERM AND SUB-CHRONIC EFFECTS OF TRAFFIC-RELATED BLACK CARBON ON SMALL AIRWAY OBSTRUCTION IN METRO MANILA TRAFFIC ENFORCERS

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Introduction Exposure to traffic-related black carbon (BC) has been linked to decreased forced expiratory flow (FEF25–75%) and Tiffeneau-Pinelli Index (FEV1/FVC), markers of airway obstruction, in several epidemiological studies. We evaluated whether short-term and sub-chronic exposures to BC on the road is linked with markers of airway obstruction in a cohort of traffic enforcers.

Methods We studied repeated measurements of FEF25–75% and FEV1/FVC on 158 traffic enforcers from the Metropolitan Manila Development Authority (MMDA) Health Study using mixed-effects models with random intercepts. We fitted a quadratic
constrained distributed lag model to estimate the cumulative effect on FEV1/FVC and FEF25–75% of ambient BC concentration during the 7 days before the visit. We also evaluated effect modification by participant characteristics using separated regression models and interaction terms.

**Results** BC was related to decreased FEF25–75% and FEV1/FVC. A 10 ug/m³ change in BC cumulative during the 7 days before the visit was associated with decreased FEF25–75% [4.2% change; 95% confidence interval (CI): -6.9 to -1.6] and decreased FEV1/FVC (3.0% change; 95% CI: -3.9 to -2.0), respectively. Correspondingly, we found similar associations with FEF25–75% and FEV1/FVC for a 10 ug/m³ change in BC that occurred 1 day before the visit (1.5% change and 0.5% change). Associations between BC and FEF25–75% and FEV1/FVC were stronger among traffic enforcers who were male, who were never smokers, or who were obese.

**Conclusions** Traffic-related BC may decrease FEF25–75% and FEV1/FVC among traffic enforcers who are obese, or non-smoking individuals; a male traffic enforcer increases this effect.

**Poster Presentation**

**Exposure assessment**

**0416** RELATIONSHIP BETWEEN EXTRACELLULAR IRON AND CIRCULATING INFLAMMATION MARKERS IN PLASMA OF MINNESOTA TACONITE WORKERS

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**Background** Higher rates of mesothelioma, pneumonia, lung cancer, and heart disease mortality have been reported in Minnesota taconite (iron ore) workers compared to the rest of the state population. Oxidative stress and inflammation are important underlying mechanisms in cancer and cardiovascular disease, and exposure to silica containing dust with a high iron content may play a key role in the observed elevated health risks.

**Methods** In this study, we compared ICP-MS-measured plasma iron concentrations to levels of circulating inflammatory markers (cytokines and chemokines) in 130 taconite workers using linear regression analysis adjusting for covariates.

**Results** Plasma iron levels varied substantially, ranging from 49 to 636 µg/dL, with a mean of 107 (±60) µg/dL. After adjusting for age, body mass index, gender and smoking status, plasma iron levels were positively associated with the levels of chemokines RANTES (p=0.06), TARC (p=0.04), and MDC (p=0.02).

**Discussion** These findings lend some support to the hypothesis that exposure to iron in taconite dust may lead to elevated levels of extracellular iron both in the lung and in the general circulation, producing reactive oxygen species and catalyzing oxidative stress. Given that TARC and MDC have been prospectively associated with lung cancer risk in other research, there is a need to better understand the relationship between extracellular iron levels and these biomarkers in taconite workers. Further analyses to assess other metrics of iron exposure from taconite dust components on plasma iron concentrations and measures of oxidative stress are warranted.

**Poster Presentation**

**Intervention studies**

**0450** PREVENTING AND PROMOTING MUSCULOSKELETAL HEALTH AT THE WORKPLACE THROUGH THE DESIGN AND EVALUATION OF AN INNOVATIVE MULTICOMPONENT INTERVENTION: THE INTEVAL SPAIN PROJECT

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**Objectives** Musculoskeletal disorders (MSD) are main cause of work absence, reducing sustainability of working trajectories. The objective of INTEVAL Spain project is to assess the effectiveness of a multifactorial intervention at the workplace to prevent MSD.

**Methods** The intervention comprises evidence-based primary (participatory ergonomics-PE), secondary and tertiary prevention (case management-CM), and health promotion targeted to MSD. All components are integrated and require full coordination. A cluster randomized trial with a late intervention control group is being implemented to evaluate its effectiveness. Quantitative and qualitative information is being obtained from databases of participating companies, questionnaires, pre-post learning tests, satisfaction surveys, project records and focus groups.

**Results** Eight clusters of nurses and aides (n=473) employed at two hospitals were selected and randomly distributed into intervention (n=4) and control (n=4). A prevalence of 80% of back and/or neck pain and 70% of high physical demands at baseline were observed. A champion was recruited, together with 8 managers, 33 referent workers and 3 workers’ representatives who volunteered to be clusters leaders. A total of 105 proposals for ergonomic improvements are being managed by operational groups. CM is based on the Scottish EASY model, and five main services are offered, combined with health promotion activities: rehabilitation, MSD health beliefs counseling, targeted cognitive behavioral therapy, Nordic walking, Mediterranean diet, emotional training and mindfulness.

**Conclusions** The intervention is being implemented with high levels of participation and acceptance. If it proves to be cost-effective, it will provide updated, relevant and innovative evidence for MSD preventive strategies at the workplace.