

group intervention MARS (Measures Against Work-Related Stress). The present study aims to compare Stop for Stress and MARS in a multicentre randomized controlled trial (RCT).

Materials and Methods The RCT is performed as a non-inferiority trial with MARS being treatment as usual. We wish to recruit 220 patients with severe work-related stress referred to the departments of occupational medicine in Aarhus and Odense, Denmark. Patients will be randomised to the two interventions, and outcomes will be measured at 0, 1.5, 3, and 12 months. The interventions are comparable in content, length, and time consumption. Primary outcomes are perceived levels of stress and stressors in the work environment. Additional outcomes are mental health symptoms, daily and cognitive functioning, heart rate variability, and register data on sickness absence, healthcare service utilization, and psychotropic drug prescriptions.

Results We will quantify if the interventions show comparable effectiveness. Moreover, we aim to identify indicators of enhanced outcomes for the two interventions based on demographics, degree of stress, and cognitive functioning. This can be used to guide future allocation of patients. Lastly we expect the interventions to be equally effective at the two departments, demonstrating successful dissemination of the interventions.

Conclusion The Stop for Stress intervention is a promising format for delivering an intervention for work-related stress. If proven effective, the intervention can decrease inequality in healthcare.

Musculoskeletal disorders

0-110 ASSOCIATION BETWEEN OCCUPATIONAL MECHANICAL EXPOSURES AND CHRONIC LOW BACK PAIN: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction Low back pain (LBP) is a worldwide health problem and a predominant reason for years lived with a disability. LBP increases the risk of sick leave and is a common cause of early retirement from the labour market. Although LBP often is temporary, 4–20% of the adult population develops chronic LBP (pain >3 months). The aim of this systematic review was to synthesise the evidence on the association between occupational mechanical exposures (lifting/carrying, awkward postures, whole-body vibrations, standing/walking, sitting, and combined exposures) and chronic LBP.

Methods We used a systematic review conducted by The Swedish Council on Health Technology Assessment as basis to identify articles published from 1980 to January 2014. For studies published after January 2014, a systematic literature

search was conducted in several databases. Two authors independently assessed the data extraction, risk of bias, and certainty of evidence. Random-effects model with weighted odds ratios was used in the meta-analysis and heterogeneity was assessed using I-squared statistics. Sensitivity analyses were conducted by dividing studies on study quality, study design, and outcome measurement.

Results Twenty-six articles were included in the meta-analysis, and the pooled odds ratios across all exposures ranged between 1.5 and 2.2. Lifting/carrying loads (OR=1.7), awkward postures (OR=1.5), and combined exposures (OR=2.2) were the only exposures rated as moderate certainty of evidence. The remaining exposures were rated either low or very low certainty of evidence. The sensitivity analyses comparing cohort and case-control studies revealed, in general, a higher odds ratio for case-control studies. Otherwise, no major differences between study quality or outcome measures were found.

Conclusion To our knowledge, this is the first systematic review and meta-analysis on the association between occupational mechanical exposures and chronic LBP. To ensure health and safety towards occupational mechanical exposures, high-quality studies are warranted with objective exposure assessments.

Radiation

0-113 ASSOCIATIONS BETWEEN OCCUPATIONAL IONIZING RADIATION EXPOSURE AND CANCER MORTALITY: AN UPDATE OF THE POOLED US NUCLEAR WORKERS STUDY

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Introduction Studies of nuclear workers provide insights into the health effects of ionizing radiation at levels relevant to contemporary workers and the general public. We evaluated the association between penetrating ionizing radiation exposure and cancer mortality subtypes in a large pooled cohort of US nuclear workers. Follow-up was extended an additional decade to improve power and examine cancers with longer latency.

Materials and Methods The pooled cohort includes 101,363 workers from five US Department of Energy and Department of Defense nuclear facilities, followed for causes of death between 1944 and 2016. Workers were individually monitored for ionizing radiation exposure with the use of personal dosimeter badges. The association between cumulative external penetrating ionizing radiation exposure and cancer subtypes were modeled as the excess relative rate per Sievert (ERR Sv-1) using Cox regression.

Results There were 13,568 cancer deaths during follow-up. We observed positive associations between ionizing radiation exposure and all solid cancer mortality (ERR Sv-1=0.19; 95% CI: -0.10, 0.52), and all lymphatic and hematopoietic cancers (ERR Sv-1=2.10; 95%CI: 0.97, 3.48). These associations were stronger among a contemporary sub cohort of workers first hired 1960 or later for both solid cancer (ERR Sv-1= 2.23; 95% CI: 1.13, 3.49) and all lymphatic and hematopoietic

cancers (ERR Sv-1 = 6.26; 95%CI: 2.86, 10.83). Additionally, we observed positive associations for several site specific lymphatic and hematopoietic cancer types, as well as lung cancer. In some instances, we observed modification by time since exposure and age at exposure.

Conclusions This analysis confirms the association between low dose, low dose-rate radiation and leukemias, and strengthens the evidence base supporting the radiogenic nature of some solid cancers. The extended follow-up, individual dosimetry, and precise estimates provided by this large pooled analysis can better inform current radiological protection models.

Respiratory effects/Diseases

O-118 RETROSPECTIVE EXPOSURE ASSESSMENT AND MIRNA IN THE EXHALED BREATH CONDENSATE IN MONITORING PAST EXPOSURE TO ASBESTOS

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Introduction Currently, the health surveillance of past exposure to asbestos conveys scarce hope of improving life expectancy and quality. To uplift the screening capability, we validated our retrospective exposure assessment techniques and explored the feasibility of using the miRNA profile in the exhaled breath condensate (EBC) as a biomarker.

Material and Methods We first classified lung fibrosis in the chest HRCT scans of 115 workers formerly exposed to asbestos and retrospectively estimated their exposure. We also assessed past exposure to asbestos and its correlation with the fibre count in the autoptic lung of 24 subjects who died from asbestos-related diseases. Finally, we used an NGS platform to detect miRNAs previously linked to lung cancer and pleural mesothelioma in the EBC of six subjects with no history of past exposure to respiratory hazards.

Results The risk of lung fibrosis increased linearly with time-weighted average (TWA, $p = 0.0045$) and cumulative exposure to asbestos ($p = 0.009$). An estimated cumulative exposure ≥ 10 fibre/ml-year conveyed an almost 11-fold (95% CI 1.54–75.7) excess risk of lung fibrosis. Cumulative exposure to asbestos correlated well with the fibre count in the autoptic lung ($p = <0.0001$).

There was a good agreement between the miRNA detection rate in the EBC and plasma samples. The Spearman's correlation between EBC and plasma miRNA counts was significant in 5/6 subjects ($p = 0.001 - <0.001$). The miRNA profile was consistent among the six participants.

Conclusions Retrospective exposure estimates can reliably reflect past exposure to asbestos. Parenchymal lung alterations show up in relation to estimates of past asbestos exposure much lower than previously thought. EBC sampling is a non-invasive, easily repeatable method to monitor the miRNA

profile. It might be profitably used to detect early treatable effects even in subjects with low-level exposure to asbestos.

Semi-plenary symposium

O-120 WHAT ORIGINATES SO DIFFERENT INTERPRETATIONS OF THE RESULTS OF STUDIES ON GLYPHOSATE AND NON-HODGKIN'S LYMPHOMA?

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Introduction The overall epidemiological evidence on the risk of non Hodgkin's Lymphoma and occupational exposure to glyphosate has led to opposite interpretations. This presentation will discuss the reasons for such inconsistent opinions.

Material and Methods We conducted a new meta-analysis of the original case-control studies and compared its results with five other meta-analyses, and three pooled analyses.

Results Four meta-analyses and two pooled analyses of case-control studies concluded for an association between the risk of NHL and ever exposure to glyphosate. Those reaching opposite conclusions were two and one, respectively. Associations were stronger between specific NHL subtypes and prolonged/lagged exposure. In the Agricultural Study, the risk of a few NHL subtypes, but not NHL overall, tended to increase by intensity weighted lifetime days of exposure to glyphosate lagged 20 years. In the meta-analysis of the original case-control studies, including the recently published InterLymph study and a new Italian case-control study, the random estimate for ever-exposure to NHL was 1.4 (95% CI 1.08–1.81), based on six studies, and that for follicular lymphoma was 1.6 (95% CI 1.08–2.44), based on three studies, with no significant heterogeneity detect across studies. Risk of follicular lymphoma increased with exposure lagged 10 years, but not by the duration of exposure, in the InterLymph study, and by intensity, frequency, and probability but not duration of exposure in the new Italian case-control study.

Conclusions The dilution of the potentially associated B-cell lymphoma subtypes within the generic NHL definition, and the difficulty in isolating the few severely exposed to glyphosate from the large ever-exposed category, might account for missing the association in the AHS study and in the two negative case-control studies. The upward trends in risk for several NHL subtypes with different exposure metrics lend credibility to the association.

COVID 19

O-122 PUBLIC TRANSPORT WORKERS AND COVID-19 RISK: A COHORT STUDY IN ITALY

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Introduction Public transport workers have never stopped working during the COVID-19 pandemic. Despite the high