prevention, disability and return to work in patients with shoulder disorders.

Sp14-1

A Systematic Review and Meta-Analysis of Occupational Factors Related to Rotator Cuff Disorders

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Background: Several epidemiological studies have found an association between shoulder-loaded work activities and specific shoulder diseases. No study has derived a dose-response relationship and the resulting doubling dose.
Objectives: The aim of this systematic review is to derive the dose-response relationship between physical workload and lesions of the shoulder rotator cuff. The results of this systematic review have been published by Seidler et al. (2020).
Methods: Using methods of a previous review (van der Molen et al. 2017), we added more recent studies. The dose-response relationship between physical occupational demands (hands at/above shoulder level, repetitive movements, forceful work, hand-arm vibrations) and specific shoulder diseases (ICD-10 M 75.1-5: rotator cuff syndrome, bicipital tendinitis, calcific tendinitis, impingement, and bursitis) was derived.
Findings: No evidence for sex-specific differences of the dose-response relationship was found. If there were at least two studies with comparable exposures, a meta-analysis was carried out. The pooled analysis resulted in a 21% risk increase (95% CI 4-41%) per 1000 hours of work with hands above shoulder level, leading to a doubling dose of 3636 hours. A meta-analysis was not possible for other diseases due to the low number of studies and differing exposure measurements. The estimate of the doubling dose was based on Dalbøge et al. (2014).
Conclusions: This systematic review with meta-analysis contributes to knowledge of the exposure level at which specific shoulder diseases, e.g., rotator cuff lesions, should be recognized as an occupational disease.

Sp14-2

Disability and physical examination signs among workers with shoulder pain

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Introduction: The study investigated shoulder pain, physical examination and disability among workers from different occupations.
Materials and Methods: The study group consisted of 3,480 office and production workers from meat and garment industry, automobile and retail grocery stores. Personal characteristics, health and working history, musculoskeletal symptoms and disability were collected. Physical examination, job title and workers' reported exposure to occupational factors known or suspected to be related to shoulder disorders were recorded.
Results: Among 2,275 males and 1,203 females (mean age 43.5±9.8 and 43.5±8.3 yrs) the liftetime shoulder pain prevalence was 24.3%; 17.3 % reported pain in the last 12 months, 8.3% in the last 7days. Using a case definition which included pain and positive physical examination, the overall prevalence was 4.8% (1.3% among automobile workers, 8% in the meat industry and 13% in the garment sector). Mean QuickDASH values ranged from 24.2 among symptomatic workers to 30.5 in the shoulder impingement syndrome group. Multivariate logistic regression analysis showed more than a twofold increased risk for both shoulder pain and shoulder impingement syndrome among females and production workers, if compared to non-production staff.
Conclusions: The prevalence rates of shoulder pain and shoulder impingement syndrome varied among different occupational groups. Production workers are at increased risk of shoulder disorders. Age and being female are also associated with the outcomes. Cases confirmed by physical examination reported higher subjective outcome measures of disability.

Sp14-3

Return to work for the worker with a surgically treated shoulder injury

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Introduction: The shoulder is capable of an extraordinary range of motion facilitated by a shallow gleno-humeral joint and stabilised by a complex system of ligaments. However, because of its mobility, it is prone to pain and injury. More than 30% of the population have shoulder pain at any point in time. There are a growing range of surgical procedures, designed to reduce pain and where possible maximise function, and these are being performed more commonly and increasingly at younger ages. As workers are encouraged to work to older ages, a growing number of patients will seek to return to work (RTW) after shoulder surgery.
Methods: This systematic review evaluated RTW in different occupations after shoulder surgery including arthroplasty, hemiarthroplasty and rotator cuff repair.
Findings: The literature is limited and heterogeneous. RTW is usually either not considered as an outcome or is a secondary outcome. Method of measurement is varied with reports of % returned by a time point, mean or median time to RTW presented. In many cases, RTW is based upon recall and not measured systematically. Few studies consider the nature of the work to which the patient needs to return and when they do so, the distinction of types of occupations is crude (e.g. heavy vs light). Return to full vs amended duties is also rarely reported.
Conclusions: There is limited evidence upon which to base recommendations to patients as to when they can safely RTW after shoulder surgery and whether or not any particular types of occupation or occupational exposure (e.g. heavy lifting, working above shoulder height) should be regarded with caution.

Sp14-4

Workplace Risk Assessment Tools for Preventing Shoulder Disorders

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Introduction: The presentation reviews tools for assessing risk for shoulder disorders and fatigue related to over-shoulder work.

Materials and Methods: The literature was searched to identify tools that estimate risk of shoulder injury or fatigue and reviewed on input and output factors and usability for design.
Results: The tools identified were RULA, OCRA, The Shoulder Tool, and a new design tool to estimate maximum acceptable arm forces based on hand location. The first 2 tools provide generic cautionary outputs for above shoulder work, e.g, "change may be needed". The 2 later tools provided more detailed design-oriented output with hand force limitations based on 3D hand posture above the shoulder. The Shoulder Tool estimates risk using a fatigue failure model using the shoulder load moment for a single hand location for a 50th% male and incorporates the effect of repetition. The tool provides cumulative exposure estimates for multiple tasks, and has been validated against physician-diagnosed shoulder tendinitis and other shoulder outcomes. The design tool is based on 25th % female strength at 3D hand locations above the shoulder and considers supraspinatus tendon impingement and shoulder muscle fatigue.
Conclusions: The risk assessment tools reviewed were designed for different purposes and each has their own limitations. Risk assessment tools that provide specific hand force limits relative to repetition rate and hand location may be the most useful for workstation and task design.

Special Session 15 Occupational safety and health strategies for engineered nanomaterials: a model for emerging technologies

Chair: Ivo Iavicoli

Session introduction

It will be tracked the history of Occupational Safety and Health activities and nanomaterials, the actions with the current evolution (additive manufacturing advanced materials and manufacturing), then it will be described how the approach could be generalized. The idea is to have a session that looks at how the occupational safety and health community addressed nanotechnology and discuss how that might be a prototype for dealing with other emerging technologies.

Sp16-1

Improving human control of hazards in industry

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Introduction: Hazards are the things that can cause harm to people, the environment and organisations. The production of nanomaterials entails hazards but nanomaterials can also be a hazard. The management of industrial hazards, such as those associated with nanomaterials, is an important and challenging human endeavour.
Materials and Methods: The control of hazards is usually done by identifying, assessing and treating risks as per ISO31000. Contemporary processes for determining the assessment and treatment of hazards followed a semi-structured brainstorming analysis approach that is recorded in simple/unintelligent software.
Results: Inadequate hazard analysis has been found to be a direct or contributing factor in over half major oil and gas incidents. In addition, the failure to implement and/or maintain well known controls for well known hazards that also been a significant factor in most major accidents. Thus more could be done to improve human control of hazards in industry.
Conclusions: To improve the control of hazards, the ISO31000 framework should be extended to put equal emphasis on risk treatment as it does on risk analysis and management. In addition, hazard identification, assessment and control requires human decisions and actions. Thus, improving human control of hazards requires the adoption of human-centred design approaches in hazard management systems. In doing so, the opportunity exists to enhance human's control of hazards with the smart use of Industry 4.0 technologies. However, these technologies can also introduce new, and emergent hazards so applications need to be well thought through and managed.

Sp15-2

OSH strategies to Industry 4.0: the example of risk assessment and management of nanomaterials

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Introduction: Industry 4.0 refers to new developments in automation and data exchange in manufacturing technologies. Its pillars include internet of things, big data, augmented reality, cybersecurity, collaborative robots, additive manufacturing, cloud computing, artificial intelligence, and nanotechnology. Although providing great solutions, industry 4.0 can also lead to new occupational health and safety risks, requiring suitable risk assessment and management. We aimed to extrapolate, from the nanotechnology areas, issues useful to inform such processes.
Materials and Methods: Pubmed, Scopus and ISI Web of Knowledge databases were searched through the terms "industry 4.0" and "nanotechnology or nanomaterial*" and "risk assessment or risk management", to capture relevant papers published in 2011-2021.
Results: Nanotechnology support industry 4.0 in the aerospace, automobile, construction, manufacturing, food processing, packaging and medical fields. High-tech uses include new materials for batteries, sensors and 3D printing. However, these innovations may lead to emerging occupational chemical and physical risks, and psychological risks due to mental overload and work density due to such flexible and dynamic smart nano-manufacturing activities.
Conclusions: Operational risks related to all stages of the 4.0 manufacturing processes should be identified. Safe and sustainable by design products and processes should be developed to "design out" or minimize hazards and risks for the workforce. Broad-based training and continuous professional development, including also occupational health and safety issues, should be encouraged.

Sp15-3

Implementation of a harmonized approach for monitoring exposure to engineered and incidental nanoparticles and their potential health effects: First results from the EU-LIFE project NanoExplore

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