



THE SELECTED ABSTRACTS

23rd Conference on Epidemiology in Occupational Health

EPICOH 2.0.13: IMPROVING THE IMPACT

183 A dynamic population-based model for the development of work-related respiratory health effects among motor vehicle repair workers exposed to isocyanates

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Session: 20. Risk Modelling

Session Date: 20/06/2013

Presentation Time: 16:20 - 16:35

Abstract

ObjectivesSpray painters, who are exposed to isocyanate mixtures, are among the occupational groups with the highest incidence of occupational asthma in industrialized countries. In the Netherlands the motor vehicle repair (MVR) industry comprises one of the largest occupational populations potentially exposed to isocyanates. We present a mathematical model which simulates a population of spray painters exposed to isocyanates longitudinally through time and tracks the development of symptoms in each worker.

MethodsFirst, based on the literature a conceptual disease model was defined which differentiates between different severities of symptoms: healthy, upper airway symptoms only, lower airway symptoms only, both upper and lower airway symptoms, and work-disabling symptoms, where all states are stratified on sensitisation. A Weibull survival analysis of data from an epidemiological study of 424 workers in the Dutch MVR industry confirmed the relationships of respiratory symptoms with isocyanate exposure and atopy. Furthermore, the data provided us with the necessary task-based exposure distributions, patterns of work and use of respiratory equipment that served as inputs for the simulation model.

ResultsIndividual workers had the highest chance of developing respiratory symptoms within the first five years of working in the MVR sector, after which their risks decrease. Furthermore, the risk of developing lower airway symptoms after 5 years doubled when a worker was atopic. The following example illustrates the application of the modelling approach: The prevalence of lower airway symptoms found in the epidemiological study was 5%. On average, 93% of spray painters used respiratory protection equipment. The dynamic population model predicted that when frequency of use increases to 98%, the prevalence of lower airway symptoms would decrease to 4%.

ConclusionsThe presented simulation model may be used to evaluate the change in health outcomes that result from different intervention strategies for the MVR sector.