

REVIEW ΑΝΑΣΚΟΠΗΣΗ

Message 9: “Be safe at work”

As occupational injuries cause approximately 350,000 deaths per year worldwide and account for more than 10 million Disability Adjusted Life Years (DALYs) in the economically active population, they represent a universal public health issue that calls for effective prevention. Although professional fields such as the field of construction, agriculture, transport and manufacturing present the highest rates of injuries, recent European Union (EU) studies reveal a common downward trend in fatal occupational injury rates in the developed world. Research on potential risk factors, mainly demographic, behavioural and environmental remains inconclusive as different countries report diversified patterns. This paper aims: (a) to describe the magnitude and the socio-economic burden of occupational injuries in the countries of the EU, (b) to outline underlying risk factors and (c) to present evidence based preventive practices that reduce the likelihood of occupational injury occurrence. This information has been used in the development of messages comprising the European Code Against Injuries (ECAI).

1. DEFINITION

Occupational injuries are defined as injuries due to an external cause resulting from an exposure related to the person's work. The definition corresponds to injuries 'that are employment-related and are the result of a traumatic event while a person is on duty.'¹ Work-related injuries of workers are commonly separated into three groups: work-road injuries, workplace injuries, and injuries that occur whilst travelling to or from work (commuting injuries).² In most cases the latter are not included in the occupational injury definition and thus are also excluded from most statistics, as rarely are there soundly based estimates for commuting injuries.²

2. MAGNITUDE OF THE PROBLEM

The most recent estimate of global occupational deaths is provided by the World Health Organisation (WHO) Comparative Risk Assessment (CRA) study that aims to assess the global burden of disease from the year 2000 onwards. Their estimate for occupational injury deaths is 312,000²

with previous studies having reached similar conclusions of over 300,000 workers killed each year.^{3,4} Summarizing, the best estimate of the annual number of fatal injury deaths of workers is 350,000, including workplace and work-road deaths and excluding commuting deaths.²

- Morbidity

Unintentional occupational injuries have been estimated to account for more than 10 million DALYs⁵ and among the worldwide economically active population of 2.9 billion workers, approximately 3.5 years of healthy life are lost per 1,000 workers due to exposure in workplaces' injury risks.¹ According to an ESAW report⁶ approximately 4.7 million accidents at work result in more than three days of absence from work occurred in the EU-15 in 2001, which can be translated roughly into a 4% of the workers having been victims of an occupational accident that year.

In 2001 there were approximately 4,900 fatal accidents at work, with one EU worker becoming a victim every five seconds and one worker dying every two hours because of an occupational accident.⁷ The highest rates concern

ARCHIVES OF HELLENIC MEDICINE 2008, 25(Suppl. 1):58-64
ΑΡΧΕΙΑ ΕΛΛΗΝΙΚΗΣ ΙΑΤΡΙΚΗΣ 2008, 25(Συμπλ 1):58-64

I.Th. Vlachantoni,¹
K. Kuhn²

¹Center for Research and Prevention of Injuries (CEREPRI) Department of Hygiene, Epidemiology and Medical Statistics, Athens University, Medical School

²Federal Institute For Occupational Safety & Health Strategy & Principle Affairs (BAUA), Dortmund, DE

Μήνυμα 9: «Φροντίστε
για την ασφάλειά σας
στην εργασία σας»

Περίληψη στο τέλος του άρθρου

Key words:

European Code Against Injuries
Injury
Occupation
Prevention
Work

accidents in construction, agriculture, transport, individual industries for the manufacture of mineral products, wood products, basic metals, utilities and the manufacture of food products.

- Time trends

Differences in types of injuries, occupational activities, employment characteristics, and implementation of safety measures can explain the existing mortality variability across different countries.⁷ A recent study of the occupational injury rates in five selected EU countries revealed that crude rates have indeed declined, confirming a common downward trend in fatal occupational injury rates in developed countries.⁸ These trends can be possibly explained by factors such as the improvement of workplace environment, changes in the economy and distribution of the workforce in EU countries, shifts within the labour force from dangerous work towards safer work and improvement of emergency services and treatments.⁹ Eurostat reports

that fatal occupational injury rates have declined from 6.1 per 100,000 persons in employment in 1994 to 4.8 in 1999 for the EU¹⁰ and more recent data confirm that the incidence rate of fatal accidents at work reduced by 23% in the EU-25 for the period 1998–2003.¹¹

3. RISK FACTORS

3.1. Demographic risk factors

The role of gender as a potential risk factor in occupational injury represents a debatable issue in the literature.¹² A review of ILO data describing injury deaths at work for 21 countries indicates that males accounted for 91% to 99% of all deaths from injury at work in all countries, independently of the level of economic development of the country (ILO) and the estimated total number of injury deaths was distributed using proportions of approximately 93:7. Nevertheless, statistical data of the last decade according figures 1 and 2, demonstrate an unclear role of gender as a risk factor.

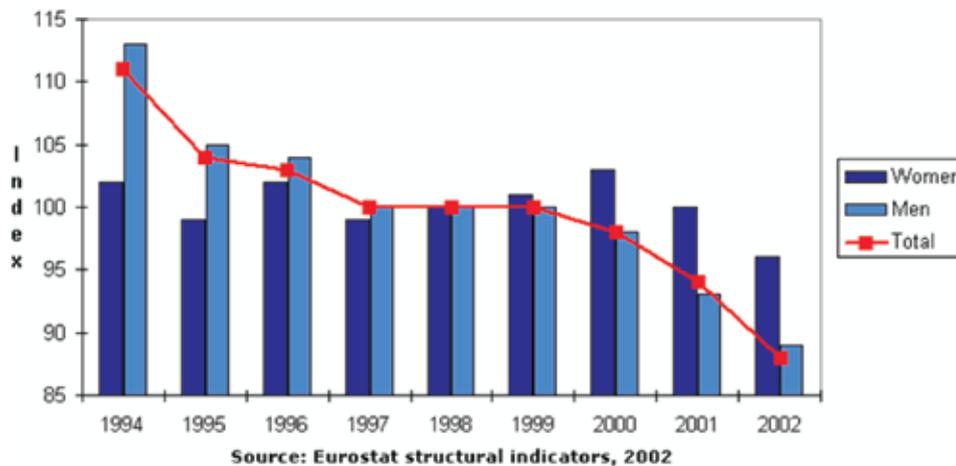


Figure 1. Serious accidents at work by gender EU-15 (1994–2002).

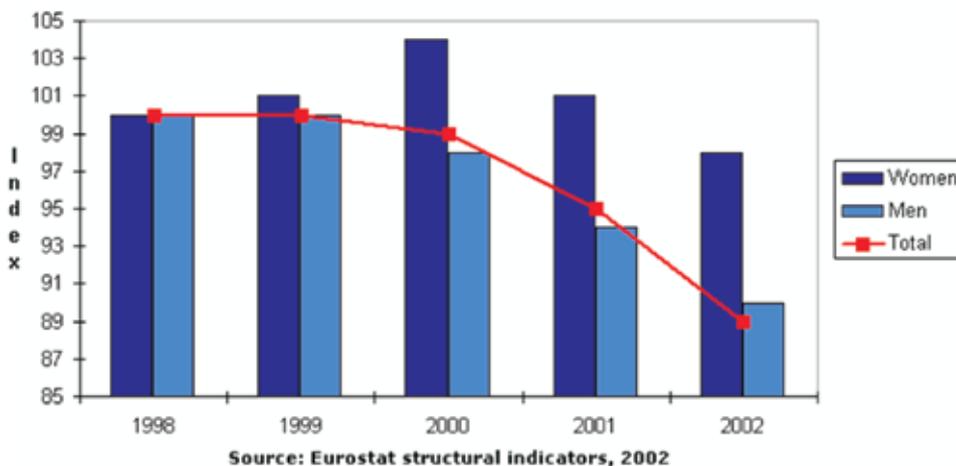


Figure 2. Serious accidents at work by gender EU-25 (1998–2002).

According to EU data, men are around three times more likely to have an accident at work compared to women and eleven times more likely to have a fatal accident at work, which can be attributed to the fact that they are usually working in more high-risk sectors and doing more full-time work,¹¹ thus the role of gender itself as a risk factor remains unclear.

Opinions diverge largely on the role of education as an occupational injury risk factor. Past research has shown education level (primary school or less) to be a risk factor specifically for back disorders,¹³ whereas more recent studies showed no relationship between education and occupational injury.¹²

Research on the role of age in occupational injuries is inconclusive as different countries present different risk patterns. For example, in the US 35% of fatal injuries occur at the age of 30–44, probably due to factors such as lack of experience.¹⁴ Overall the observed pattern corresponds to a steady rise in the occupational injury incidence from the youngest groups to about 64 years of age.¹

3.2. Behavioural risk factors

Risk-taking behaviours such as alcohol consumption,^{15,16} non-use of seat belts, use of violence, riding a motorcycle, and/or recent history of driving under the influence of alcohol¹² have been suggested as possible risk factors for occupational injury. Also, sleep disorders, smoking, and lack of physical activity have been found to alter health status and work ability, thus leading to fatigue and altered risk perception, which increase the likelihood of injuries.¹⁷

3.3. Environmental risk factors

Environmental stressors such as high ambient noise levels,^{18,19} heat,^{20,21} poor lighting,²² high physical effort,^{23,24} overcrowding^{25,26} and need for sustained attention²⁷ may be precipitating factors for occupational injuries. Other important risk factors suggested as injury risk factors are physical effort^{23,24} and climate discomfort.^{20,21} Since workstations are usually overcrowded with high ambient noise levels and bad lighting, workers are often subjected to a multitude of harsh conditions, which can ultimately have a cumulative effect on injury risk.²⁸

4. EFFECTIVE PREVENTIVE PRACTICES

- Training of workers and provision of information

Informing workers on the risks their work discloses

and training them on safe practices are some of the most frequently used means of occupational injury prevention. Effective interventions vary with respect to the training material and training patterns, as well as to the recipients of such information and the implementation settings. Interventions concerning nursing staff, such as training on the proper use of lifting equipment²⁹ informative sessions with job-specific content carried out either annually as part of the continuing education programs or as part of the compulsory orientation programs for new employees²⁹ and back school programs³⁰ have been tested and found to reduce significantly injury rates in hospitals and nursing homes. Also, stress and pain management sessions (under the 'Cognitive Behavioral Therapy' term) for nurses over a 6-week period by a clinical psychologist led to reduction in pain intensity scores but at the same time to an increase in stress score, thus proving to be only partially effective.³¹

In the field of construction works, a multiple-use educational intervention for ladder set-up and use,³² safety campaigns using educational brochures, television/radio programs and local press articles containing expert advice have been useful in reducing injury risk in a sustained manner.³³ Additionally, a study evaluating a Decking Fall Prevention System found that providing safety information at daily meetings and during weekly task-specific toolbox talks and training on the proper use of personal protective equipment according to existing regulations and manufacturing instructions ensured a 100% fall protection.³⁴ Finally, 45-minute training sessions over a 4-week period responded successfully to sudden back loading with an effect size of 0.53 SD in office employees in the USA³⁵ and evidence-based prevention programs including educational activities also brought a relative reduction of 27% of work-related skin problems in cleaners at a one-year follow up in a study carried out in Denmark.³⁶

- Personal protective equipment (PPE)

Providing the correct equipment by the employer to the employee and teaching him on its correct use is another recurrent notion among successful injury prevention practices. As examples, the use of air-assisted friction reducing devices for lateral patient transfer by nursing staff was found to be a cost-effective solution recommended over the use of traditional draw sheet method³⁷ and the use of mechanical resident lifting equipment not only decreased the resident handling injury rates but also demonstrated a beneficial effect for all nursing homes and all staff regardless of age or work patterns.^{29,30}

Examples from different professional fields are the

replacement of duty uniform pants with shorts that reduced the thermal burden suffered by the firefighters and improved their operational effectiveness.³⁸ In a manufacturing company, a new type of wafer container (pod) with power grip handles proved to be partially effective as it had a significant effect on improved wrist posture but not on the whole body workload. Lastly, providing devices for recapping needles and small-size trays to facilitate one-handed recapping were effective in reducing needle stick and sharp injuries in emergency and labor rooms.³⁹

- Engineering modifications

Working environment represents a constant source of risk for the worker if it does not accommodate his/her needs during working time. Making it and maintaining it safe, as well as reporting newly discovered hazards, can reduce chances of an accident and a subsequent injury. In a study regarding workers' health in hospital and research laboratories, workstation redesign was implemented successfully in order to minimize risk of musculoskeletal injury in laboratory technologists who routinely performed piping tasks. The features addressed were the primary work counter's height, the adjustability of the seat pan and back of the chair, the proper task lighting and overall comfort of the workstation.⁴⁰ Also, in six steel construction sites, engineer modification was realized to prevent construction workers from falling and the proposed fall protection system ensured a 100% fall protection during their work activity.³⁴

In another study carried out in southern Finland, between 1989 and 1994, site visits were realized in wood-processing companies to reinforce an intervention of changes in order to make their work environment safer. The participating companies showed a significant decline in accident rate compared to the control companies. Results indicated that occupational accidents could be prevented by identifying and anticipating hazards and by implementing safety measures pertaining to the work environment.⁴¹

- Legislation and regulations

Regulations concerning injury prevention practices can take the form of specific guidelines issued by the companies or organizations responsible for the workers' health. 'Zero lift policy' guidelines are such an example; they were applied in small rural hospitals in Washington aimed to reduce back injuries among health care workers and found to be effective, as injury claims decreased by 43% in the participating hospitals from 2000 to 2004.⁴² In a

similar study, written guidelines 'zero lift policy' were used to prevent nursing staff injuries associated with resident handling and produced a significant improvement, with the largest reductions observed among the more serious injuries that resulted in workers' compensation claims.²⁹

- Risk assessment

Risk assessment has been useful in preventing injuries since it leads to a risk evaluation and recommendations tailored to each different setting and working situation. As an example, at a cleaning services department, a consultative team consisting of representatives from management, employees and the hospital's ergonomist was formulated. The aim was to assess the risk of manual handling in the workplace and to make recommendations in reducing the rate and severity of workers' compensation injury in hospital cleaners. This intervention has been effective since it significantly reduced the numbers and rates of injury, although not the severity of injury. Even so, it was concluded that the recommendation of the consultative team could produce a meaningful and sustained reduction in rates of injury within the risk population.⁴³

- Health and safety management

Frequent inspections of job sites, safety methods and equipment used contribute to a decrease in risks at the workplace. In a construction company, the industry's safety program implementation, focusing mainly on fall prevention practices, was further reinforced with the contribution of a third party (University) intervention, which performed the audit activity, to which the industry responded positively.⁴⁴

5. CONCLUSION

Occupational injuries are largely preventable if improvements are to be made within the working environments. Engineering controls, administrative policies, health and safety information and education are indispensable practices in order to promote safety-conscious attitudes and behaviour at work. The distribution of burden by type of external cause of mortality has allowed developed countries to focus on preventive actions at work, resulting in a reduction of injury rates over time. Such actions are the following:

- Read all safety information supplied by your employer and follow the safety rules. Know the risks so that you can avoid potential harm.

- Protect yourself and others by using the necessary safety procedures, tools and devices. Read the guidelines and the instructions for use.
 - Actively participate in all relevant education and training for safety at your work.
 - Wear the necessary personal protective equipment properly: eye-protection, special clothing, including gloves, harnesses, belts, helmets, shoes or whatever is required by your work that could minimize any injury if an accident occurs.
 - Take an active part in eliminating risks from the workplace. If you discover a new hazard or safety measures that do not work properly, report them to your employer.
- Make sure your employer:
- Possesses assessments of the risks to safety and health at

work (including those facing groups of workers exposed to particular risks) and has explained them to you.

- Takes and explains the appropriate protective measures and, if necessary, provides any protective equipment and training required.
- Provides adequate supervision and health and safety training, including induction training for new or inexperienced workers.
- Keeps a list of occupational accidents resulting in a worker being unfit for work for more than three working days and has informed you on the reporting system.
- Draws up reports on occupational accidents suffered by the workers for the responsible authorities and in accordance with national laws and/or practices.

ΠΕΡΙΛΗΨΗ

Μήνυμα 9: “Φροντίστε για την ασφάλειά σας στην εργασία σας”

I. Θ. ΒΛΑΧΑΝΤΩΝΗ,¹ KARL KUHN²

¹Κέντρο Έρευνας και Πρόληψης Ατυχημάτων (ΚΕΠΑ), Εργαστήριο Υγιεινής, Επιδημιολογίας και Ιατρικής Στατιστικής, Ιατρική Σχολή Πανεπιστημίου Αθηνών, ²Federal Institute For Occupational Safety and Health Strategy and Principle Affairs (BAUA), Dortmund, DE

Αρχεία Ελληνικής Ιατρικής 2008, 25(Συμπλ 1):58–64

Καθώς τα θανατηφόρα εργατικά ατυχήματα ανέρχονται παγκοσμίως στα 350,000, και εξηγούν πάνω από 10 εκατομμύρια χρόνια χαμένης υγιούς ζωής DALYs του ενεργού οικονομικού πληθυσμού, αντιπροσωπεύουν ένα πάγκοινο πρόβλημα της δημόσιας υγείας το οποίο ζητά επείγοντως αποτελεσματικές παρεμβάσεις. Παρόλο που εργασιακοί τομείς όπως ο κατασκευαστικός τομέας, ο τομέας της γεωργίας, των μεταφορών και της βιομηχανίας παρουσιάζουν μεγάλα ποσοστά ατυχημάτων, πρόσφατες ευρωπαϊκές μελέτες έδειξαν μια κοινή καθοδική πορεία θανατηφόρων εργατικών ατυχημάτων στις ανεπτυγμένες χώρες. Η έρευνα που σχετίζεται με πιθανούς παράγοντες κινδύνου, όπως δημογραφικούς, συμπεριφορικούς και περιβαλλοντικούς παραμένει ακόμα ανεπαρκής καθώς κάθε χώρα αναφέρει και διαφορετικά παραδείγματα. Αυτή η εργασία στοχεύει: (α) να περιγράψει την έκταση του προβλήματος και τις κοινωνικο-οικονομικές επιπτώσεις των εργατικών ατυχημάτων στην Ευρωπαϊκή Ένωση, (β) να επισημάνει τους υποκείμενους παράγοντες κινδύνου, και (γ) να παρουσιάσει τις επιστημονικά αποδεδειγμένες πρακτικές που μειώνουν αποτελεσματικά την πιθανότητα των εργατικών ατυχημάτων. Οι πληροφορίες αυτές έχουν χρησιμοποιηθεί στη δημιουργία μηνυμάτων που συμπεριλαμβάνονται στον Ευρωπαϊκό Κώδικα Κατά των Ατυχημάτων.

Λέξεις ευρετηρίου: Ατύχημα, Επάγγελμα, Εργασία, Ευρωπαϊκός Κώδικας Κατά των Ατυχημάτων, Πρόληψη

References

1. CONCHA-BARRIENTOS M, IMEL NELSON D, FINGERHUT M, DRISCOLL T, LEIGH J. The global burden due to occupational injury. *Am J Ind Med* 2005, 48:470–481
2. DRISCOLL T, TAKALA J, STEENLAND K, CORVALAN C, FINGERHUT M. Review of estimates of the global burden of injury and illness due to occupational exposures. *Am J Ind Med* 2005, 48:491–502
3. TAKALA J. Global estimates of fatal occupational accidents. Sixteenth International Conference of Labor Statisticians Geneva: ILO, 1998

4. TAKALA J. Introductory report: Decent work-safe work. XVIth World Congress on Safety and Health at Work Vienna: ILO, 2002
5. FINGERHUT M, DRSCOLL T, IMEL-NELSON D, CONCHA-BARRIENTOS M, PUNNETT L, PRUSS-USTIN A ET AL. Contribution of occupational risk factors to the global burden of disease- a summary of findings. *Scand J Work Environ Health Supplement* 2005, 1:58–61
6. ESAW European Statistics on Accidents at Work, http://ec.europa.eu/employment_social/news/2002/apr/1130_en.pdf (accessed Sept 2007)
7. Work and Health in the EU, A statistical portrait, 2003
8. LOOMIS D, BENA JF, BAILER AJ. Diversity of trends in occupational injury mortality in the United States, 1980–1996. *Injury Prevention* 2003, 9: 9–14
9. BENAVIDES F, BENACH K, MARTINEZ J M, GONZALEZ S. Description of fatal occupational injury rates in five selected European Union countries: Austria, Finland, France, Spain and Sweden. *Safety Science* 2005, 43:497–502
10. EUROSTAT. European social statistics-accidents at work and work-related health problems. Data 1994–2000. European Commission, Luxembourg, 2003
11. 13th CEIES Seminar-Health and safety at work: EU statistics, European Commission, Luxembourg: Office des publications officielles des CE, 2002
12. CRAIG BN, CONGLETON JJ, KERK C, AMENDOLA A, GAINES W. Personal and non-occupational risk factors and occupational injury/illness. *Am J Ind Med* 2006, 49:249–260
13. LEIGH J, SHEETZ R. Prevalence of low back pain among fulltime United States workers. *Br J Ind Med* 1989, 46:651–657
14. NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH). Worker Health Chartbook, 2000. US Department of Health and Human Services, National Institute for Occupational Safety and Health, 2000
15. GAUCHARD GC, MUR JM, TOURON C, BENAMGHAR L, DEHAENE D, PERRIN P, CHAU N. Determinant of accident proneness: a case-control study in railway workers. *Occupational Medicine* 2006, 56:187–190
16. GAUCHARD GC, CHAU N, TOURON C, BENAMGHAR L, DEHAENE D, PERRIN P ET AL. Role of certain individual characteristics in occupational accidents due to disequilibrium: a case-control study in the employees of a railway company. *Occup Environ Med* 2003, 60:330–335
17. ULFBERG J, CARTER N, EDLING C. Sleep-disordered breathing and occupational accidents. *Scand J Work Environ Health* 2006, 26:237–242
18. WILKINS PA, ACTON WI. Noise and accidents: a review. *Ann Occup Hyg* 1982, 25:249–260
19. NOWIER MH. Noise exposure as relate to productivity, disciplinary actions, absenteeism, and accidents among textile workers. *J Safety Res* 1984, 15:163–174
20. FROMM P, CAINEY. Heart stress and helicopter pilot errors. *J Occup Med* 1993, 35:720–724
21. JOKEL MV. The effect of the environment on human performance. *Appl Ergon* 1982, 13:269–280
22. SLAPPENDEL C, LAIRD I, KAWACH I, MARSHALL S, CRYER C. Factors affecting work-related injury among forestry workers: a review. *J Safety Res* 1993, 4:19–32
23. FRUMKIN H, WILLIAMSON M, MAGID D, HOLMES JH, GRISSO JA. Occupational injuries in a poor inner-city population. *J Occup Environ Med* 1995, 37:1374–1382
24. KUMAR S. A conceptual model of overexertion, safety and risk of injury in occupational setting. *Human Factors* 1994, 36:197–206
25. NIKOLI N, MARRIC T. The analysis of work-related injuries in a tractor factory. *American Industrial Hygiene Association* 1994, 55:450–452
26. KAPLAN M, KNUTSON S. Women in manufacturing industries: ergonomic factors and deficiencies. *IL: Year Book Medical Publishers* 1980:139–155
27. HUDOCK SD, DUCHON JC. A safety risk evaluation of vigilance tasks in the US surface mining industry presented at the Human Factors Society 32nd Annual Meeting. Anaheim, CA, 1988
28. MELAMED S, YEKUTIEKI D, FROMM P, KRISTAL-BONEH E, RIBAK J. Adverse work and environmental conditions predict occupational injuries (The Israeli Cardiovascular Occupational Risk Factors Determination in Israel Study, CORDIS). *Am J Epidemiol* 1999, 150:18–25
29. COLLINS JW, WOLF L, BELL J, EVANOFF B. An evaluation of a "best practices" musculoskeletal injury prevention program in nursing homes. *Injury Prevention* 2004, 10:206–211
30. GUTHRIE PF, WESTPHAL L, DAHLMAN B, BERG M, BEHNAM K, FERRELL D. A patient lifting intervention for preventing the work-related injuries of nurses. *Work* 2004, 22:79–88
31. MENZEL NN, ROBINSON ME. Back pain in direct patient care providers: early intervention with cognitive behavioral therapy. *Pain Management Nursing* 2006, 7:53–63
32. LINEBERRY GT, WIEHAGEN B, SCHARFT, MCCANN M. Progress toward a multi-use educational intervention for reducing injury risk in the set-up and use of extension ladders. *ICOH*. 2002
33. MANCINI G, BALDASSERONI A, LAFFI G, CURTI S, MATTIOLI S, VIOLANTE F S. Prevention of work related eye injuries: long term assessment of the effectiveness of a multicomponent intervention among metal workers. *J Occup Environ Med* 2005, 62:830–835
34. PAINE DM, MCCANN M. Evaluation of a Decking Fall Protection System System limits falls, improves site safety. *Professional Safety Magazine* 2004, 49
35. PEDERSEN MT, ESSENDROP M, SCOTTE H, JORGENSEN K, FALLENTIN N. Training can modify back muscle response to sudden trunk loading. *European Spine Journal* 2004, 13
36. FLYVHOLM MA, MYGIND K, SELL L, JENSEN A, JEPSEN KF. A randomised controlled intervention study on prevention of work related skin problems among gut cleaners in swine slaughterhouses. *J Occup Environ Med* 2005, 62:642–649
37. BAPTISTE A, BODA SV, NELSON AL, LLOYD JD, LEE WE 3rd. Friction-reducing devices for lateral patient transfers: a clinical evaluation. *AAOHN J* 2006, 54:173–180
38. McLELLAN TM, SELKIRK GA. The management of heat stress for the firefighter: a review of work conducted on behalf of the Toronto Fire Service. *Industrial Health* 2006, 44:414–426
39. SRIKRAJANT J, POCHAMARN C, CHITTREECHEUR J, APISARNTHANARAK A, DANCHAIVIJITR S. Effectiveness of education and problem solving work group on nursing practices to prevent needlestick

- and sharp injury. *J Med Assoc Thai* 2005, 88:115–119
40. OHSAH. Reducing the Risk of Musculoskeletal Injury in Healthcare Laboratory Technologists Performing Pipetting Tasks. Occupational Health & Safety Agency for Healthcare in BC, 2003
41. VARONEN U, MATTILA M. Effects of the Work Environment and Safety Activities on Occupational Accidents in Eight Wood-Processing Companies. *Hum Fact Ergonom Manufact* 2002, 12:1–15
42. CHARNEY W, SIMMONS B, LARY M, METZ S. Zero lift programs in small rural hospitals in Washington state: reducing back injuries among health care workers. *Am Assoc Occup Health Nurses* 2006, 54:355–358
43. CARRIVICK PJW, LEE AH, YAU KKW. Consultative team to assess manual handling and reduce the risk of occupational injury. *J Occup Environ Med* 2001, 58:339–344
44. BECKER P, FULLEN M, AKLADIOS M, HOBBS G. Prevention of construction falls by organizational intervention. *Injury Prevention* 2001, 7:64–67

Corresponding author:

I. Th. Vlachantoni, Center for Research and Prevention of Injuries (CEREPRI), Department of Hygiene, Epidemiology and Medical Statistics, Athens University Medical School, 75, Mikras Asias street, GR-11527 Athens, Greece, Tel: +30 210 7462187, Fax: +30 210 7462105
e-mail: irvlach@med.uoa.gr