La Medicina del Lavoro Med Lav 2009; *100*, 4: 258-267

Writing a Cochrane systematic review on preventive interventions to improve safety: the case of the construction industry

H.F. van der Molen*, **, P.L.T. Hoonakker***, Marika M. Lehtola****, H. Hsiao*****, R.A. Haslam******, A.R. Hale*******, J. H. Verbeek*, ****

* Academic Medical Center, University of Amsterdam, Department: Coronel Institute of Occupational Health, Amsterdam, the Netherlands
** Arbouw, Dutch National Institute for Safety and Health in the Construction Industry, Harderwijk, the Netherlands
*** Center for Quality and Production Improvement, University of Wisconsin, USA
**** Finnish Institute of Occupational Health, Centre of Expertise for Good Practices and Competence, Team of Knowledge Transfer in Occupational Health and Safety and the Cochrane Occupational Health Field of the Cochrane Collaboration, Kuopio, Finland
***** National Institute for Occupational Safety and Health, Morgantown, West Virginia, USA
****** Department of Human Sciences, Loughborough University, Leicestershire, UK
***** Safety Science Group, Delft University of Technology, Delft, the Netherlands

Key words
Preventive measures; occupational accidents; construction industry

Summary
Objectives: *The objective of this paper is to describe the main steps and to conduct a systematic literature review on preventive interventions concerning work-related injuries and to illustrate the process.* **Methods:** *Based on the Cochrane handbook, a structured framework of six steps was outlined for the development of a systematic review. This framework was used to describe a Cochrane systematic review (CSR) on the effectiveness of interventions to prevent work related injuries in the construction industry.* **Results:** *The 6 main steps to write a CSR were: formulating the problem and objectives; locating and selecting studies; assessing study quality; collecting data; analysing data and presenting results; and interpreting results. The CSR on preventing injuries in the construction industry yielded five eligible intervention studies. Re-analysis of original injury data of the studies on regulatory interventions, through correcting for pre-intervention injury trends led to different conclusions about the effectiveness of interventions than those reported in the original studies.* **Conclusions:** *The Cochrane handbook for systematic reviews of interventions provides a practical and feasible six-step framework for developing and reporting a systematic review for preventive interventions.*

Riassunto
«Scrivere una revisione sistematica Cochrane sugli interventi di prevenzione per migliorare la sicurezza: il caso dell'industria edilizia». *Lo scopo di questo lavoro è quello di descrivere e spiegare i passaggi principali utilizzati per preparare una revisione sistematica della letteratura sugli interventi di prevenzione degli infortuni sul lavoro. Basandosi sul manuale Cochrane, è stato delineato uno schema di lavoro in sei passaggi per la creazione di una revisione sistematica. Questo schema è stato usato per descrivere una revisione sistematica Cochrane (CSR) dell'effi-*

Pervenuto il 18.1.2009 - Accettato il 12.3.2009
Corrispondenza: Dr. Henk van der Molen, Arbouw, Coronel Institute, P.O. Box 8114, Amsterdam, 1005, Netherlands
E-mail: vandermolen@arbouw.nl h.f.vandermolen@amc.uva.nl

cacia empirica di interventi per prevenire gli infortuni sul lavoro nel settore delle costruzioni. I sei passaggi fondamentali per scrivere una CSR sono: 1) l'individuazione dei problemi e degli obiettivi; 2) il reperimento e la selezione degli studi; 3) il giudizio di qualità degli studi; 4) la raccolta dei dati; 5) l'analisi dei dati e la presentazione dei risultati; 6) l'interpretazione dei risultati. La CSR sulla prevenzione degli infortuni nell'industria delle costruzioni ha individuato cinque studi aventi i criteri necessari. La nostra analisi dei dati originali sugli infortuni riportati negli studi selezionati, effettuata correggendo per i trend pre-intervento, ha portato a conclusioni sull'efficacia diverse da quelle formulate dagli autori delle pubblicazioni originali. Il manuale Cochrane per le revisioni sistematiche fornisce uno schema di lavoro in sei passi che è pratico e facilmente applicabile per la creazione e la presentazione di una revisione sistematica sugli interventi di prevenzione.

Introduction

Knowledge about effective interventions is critical to be able to reduce the health and safety risks at workplaces and, ultimately, to prevent work-related diseases and injuries of workers. The evidence for effectiveness of interventions to prevent work-related diseases or injuries can be obtained in two ways (15): (a) based on scientific research evidence and (b) based on a consensus development (a systematic combination of evidence-based measures, practical experiences and/or consensus between the employers and employees concerned).

Literature reviews can lead to the improved specification of the active ingredients of the intervention (6) and periodically performed systematic reviews can provide the most up-to-date and best evidence base of interventions to prevent work-related diseases and injuries. The construction industry has experienced a high incidence rate of work-related injuries (1, 14); construction safety is thus an important subject that will benefit substantially from this systematic reviewing process. The construction industry is a vital component of the economies of all countries around the world, employing a considerable workforce. The quality of life of construction workers and the business of excellence in construction are compromised by occupational injuries. Many expert-based recommendations have been reported in the literature to reduce or eliminate health and safety risks in the construction sector. Various interventions have also been studied to mitigate occupational injuries in construction work (4, 10). Yet the effectiveness of the different interventions on occupational injuries remains unclear (18).

Supported by various researchers, policy makers and experts involved in the health and safety of the construction sector, this study (i) described the process of a Cochrane systematic review on prevention interventions, (ii) evaluated the effectiveness of current interventions, and (iii) summarized the high quality evidence base of interventions to prevent occupational injuries in the construction industry.

Methods

A structured framework of six steps for the development of a Cochrane systematic review (CSR) is outlined, based on the Cochrane handbook (7, 8). The Cochrane Handbook for Systematic Reviews of Interventions is the official document that describes in detail the process of preparing and maintaining systematic reviews on the effects of healthcare interventions to standards set by Cochrane.

The current version of the Handbook is 5.0.0 (also available in full in browsable format only). An approved, peer reviewed and published protocol is an essential element in the development of CSR's because it contains objectives and methods of the planned CSR. Eventually, this protocol is replaced by the review itself.

The structured framework and the protocol for the CSR on preventing injuries in the construction industry was used to describe the development of the CSR about the effectiveness of interventions to prevent work-related injuries in the construction industry (17, 19, 20).

Results

Step 1 Formulating the problem

The goal of step one is to determine the focus and specific objective of the CSR. The objective can be structured by clearly defined questions regarding the types of participants (P), types of interventions (I), the comparisons (C) and the types of outcomes (O) that are of interest. In addition to this PICO, the types of studies that are relevant for answering the defined questions should be specified. In general the more precise one is in defining the questions, the more focused the review (7, 8).

The objective of the CSR in the construction industry was to assess the effects of interventions aimed at preventing occupational injuries among workers at construction sites. Randomized controlled trials, controlled before-after studies and interrupted time series studies (ITSs) were eligible for inclusion in this review. A study is considered to be an ITS when i) there were at least three time points before and after the intervention, irrespective of the statistical analysis used, and ii) the intervention occurred at a clearly defined point in time (9, 24). These are restrictive criteria when the range of published work on construction safety management is reviewed, as the subsequent steps will show. However, the literature that is retained can be relied on with a high degree of confidence.

The population was limited to construction workers (employed workers or self-employed workers). However, construction workers are difficult to define. Construction work is generally managed at a fixed place of business (office), but construction activities are performed at (multiple) project sites. More than 80 construction jobs exist, while the work is performed at varying work sites with changing colleagues and supervisors. For the purposes of this review, construction workers were defined as persons working at a construction site for building/housing/residential, or road/highway/civil engineering, or offices/commercial, or industrial installations (for example, ventilation, pipelines and siding) work. Construction work carried out by the workers includes new work, additions, alterations, or maintenance and repairs. These definitions are based on the North American Industry Classification System (21).

All interventions aimed at preventing occupational injuries, compared with no or alternative interventions, could be included. For a study to be included, work-related fatal or non-fatal injury must have been an outcome. The following modified definition of injury was used, based on the The Injury Chartbook published by the World Health Organization (3, 22): *"Non-fatal occupational injury is a body lesion at the organic level, resulting from acute exposure to energy (mechanical, thermal, electrical, chemical or radiant) in a work environment in amounts that exceed the threshold of physiological tolerance. In some cases (for example, drowning, strangulation, freezing), the injury results from an insufficiency of a vital element"*. Injuries resulting from traffic crashes were also included, if they occurred during commuting of workers to or from their construction work site. All sources of injuries data, including self-report, were considered.

Step 2 Locating and selecting studies

The goal of step two is to locate and select studies for the CSR. A search for relevant studies generally begins with electronic bibliographic databases. Manual search in journals, reference lists of already selected articles and websites supports the search in electronic databases. An electronic search strategy should generally include the sets of terms that cover the PICO (see step 1). The process by which studies will be selected for inclusion should be described in the review protocol. To help ensure that the inclusions of studies are reproducible, it is advisable that at least two authors independently apply the inclusion criteria to all the potentially relevant reports and articles that are retrieved. Pilot testing can be used to refine and clarify the inclusion criteria, train the reviewers and ensure that the criteria can be applied consistently by more than one person (7, 8).

For the CSR in the construction industry, search terms that covered the concepts of 'working at construction sites' (participants), 'interventions' (inter-

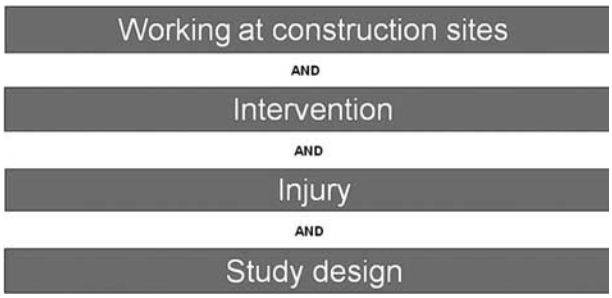

Figure 1 - Four combined concepts for electronic search strategy

***Figura 1** - Quattro concetti combinati per una strategia di ricerca elettronica*

ventions), 'injury' (outcome measure) and 'study design' were used to identify studies in the electronic databases (figure 1). Also reference lists of relevant papers and websites were searched. The searches were not restricted by language or publication status.

For the systematic review in the construction industry, title and abstracts were independently screened by two authors to identify potentially relevant studies. The full text of these articles was assessed for eligibility against the inclusion criteria. Disagreement was resolved by discussion. In every case where a disagreement persisted, a third author made the final decision. Articles in languages other than English were translated by a native speaker.

Altogether 7522 titles were found in the search of seven databases (7484 titles), from websites (35 titles) and by the reference-list checking of relevant papers (3 titles). After the titles and abstracts had been screened for eligibility, 55 potential full articles were evaluated more closely. In total, four ITS and one controlled ITS study were included in the construction review. No randomized controlled studies were found.

Step 3 Assessment of study quality

Step three is aimed at assessing the quality of the studies. Factors that warrant assessment are those related to applicability of findings, validity of individual studies and design characteristics that affect interpretation of results. Applicability is related to the definition of the PICO outlined in step 1. Training and experience in study design and critical appraisal is required by the authors of the review (7, 8).

The quality of the included studies was independently assessed by two authors. For randomized and non-randomized controlled studies, the internal validity scale of Downs and Black (12) to assess study quality was planned to be used, however, no such study designs were found. For ITS studies the six criteria developed by the EPOC Review Group (9) were used for the quality assessment: i) intervention is independent from other changes, ii) reliable statistical inference enabled, iii) intervention was unlikely to affect data collection, iv) blinded assessment of outcome variable existed, v) completeness of the data set taken into account, vi) reliable primary outcome measure used. Each criterion was scored with 1 point if it was met and with 0 if it was unclear or not met. The highest quality score was 4 points of a maximum of 6; the aggregate quality score of the included studies was below 67%.

Step 4 Collecting data

The goal of step four is to gather the necessary information for the CSR based on the primary studies. A data collection form serves at least three important functions. First, the data collection form is directly linked to the formulated review questions and planned assessment of included studies and therefore provides a representation of these. Second, the data collection form is the historical record of the (changes to) decisions that occur throughout the review process. Third, the data collection form is the data repository from which the analysis will emerge. Information about study references and authors, study eligibility and study characteristics (PICO) should be extracted. Reviewers need to set up decision rules for data collection and reporting. Also pilot testing is recommended (7, 8).

For the CSR in the construction industry data were extracted independently by two authors. A

form was developed to extract the following data from each article:

• study design (cluster) randomized controlled trial, controlled before-after study, or interrupted time series);

• participants (number, trade, age, gender and exposure);

• intervention (target: worker and work team, workplace, materials, equipment, or organisation), implementation strategy (information, compulsion, education, facilitation, or persuasion) and content intervention;

• outcome (primary outcome, methods used to assess outcome measures, and duration of follow-up);

• setting (size of the company, culture, country, industry subsector, and trade and job).

Data on observations over time were derived from tables of results or graphs from the original studies, or directly from the study authors. All studies with fatal injuries as an outcome were standardized into fatal injuries per 1,000,000 workers per year. The studies with non-fatal injuries as outcome were standardized into injuries per 100 person years per year.

Step 5 Analysing data and presenting results

The goal of step five is to describe and eventually further analyse the data of the included studies. CSR contain analyses of the primary studies. Analyses may be narrative, such as a structured summary and discussion of the studies' characteristics and findings, or quantitative, that is involving statistical analysis. Meta-analysis provides a statistical method for describing the direction, size and consistency of the pooled effect. Assessment of the strength of evidence for the effect relies additionally on judgements based on assessments of study design and study quality, as well as statistical measures of uncertainty. Narrative synthesis uses subjective (rather than statistical) methods where meta-analysis is either not feasible or not sensible. In a narrative synthesis the method used for each step (1-5) should be prespecified, justified and followed systematically. Bias may be introduced if the results of one study are inappropriately stressed over those of another (7, 8).

For the CSR in the construction industry data from the original papers were extracted and re-analyzed according to recommended methods for analysis of ITS designs (24). These methods utilize a segmented time series regression analysis to estimate the effect of an intervention while taking into account secular time trends and any autocorrelation between individual observations. Re-analysis with autoregressive modelling made it possible to estimate regression coefficients corresponding to two standardized effect sizes for each study: i) change in level and ii) change in slope of the regression lines before and after the intervention (24). A change in level was defined as the difference between the observed level at the first intervention time point and that predicted by the pre-intervention time trend. A change in slope was defined as the difference between post- and pre-intervention slopes. The change in level stands for an initial intervention effect and a change in slope for a sustained effect of the intervention. A negative change in level or slope represents an intervention effect in terms of a reduction in injuries. Data were standardized by dividing the outcome and standard error by the pre-intervention standard deviation as recommended by Ramsay et al. (2001) (23). Methodological heterogeneity was assessed with respect to research setting, applied interventions, study design and population. Results were pooled for studies which had the same study design and evaluated similar interventions, participants and outcomes.

Results of the re-analysis of all three included regulatory studies included, concerning introduction of a trenching and excavation standard (28) and a fall arrest standard (11, 18), which all originated in the USA, did not provide evidence of the effectiveness of regulations to reduce fatal and non-fatal injuries in the construction industry (figure 2). All studies showed a downward trend of injuries over time before the intervention which corresponds with the downward trend of injuries in USA economic sectors during the same study periods as the studies included (figure 3). Re-analysis of the studies showed no significant

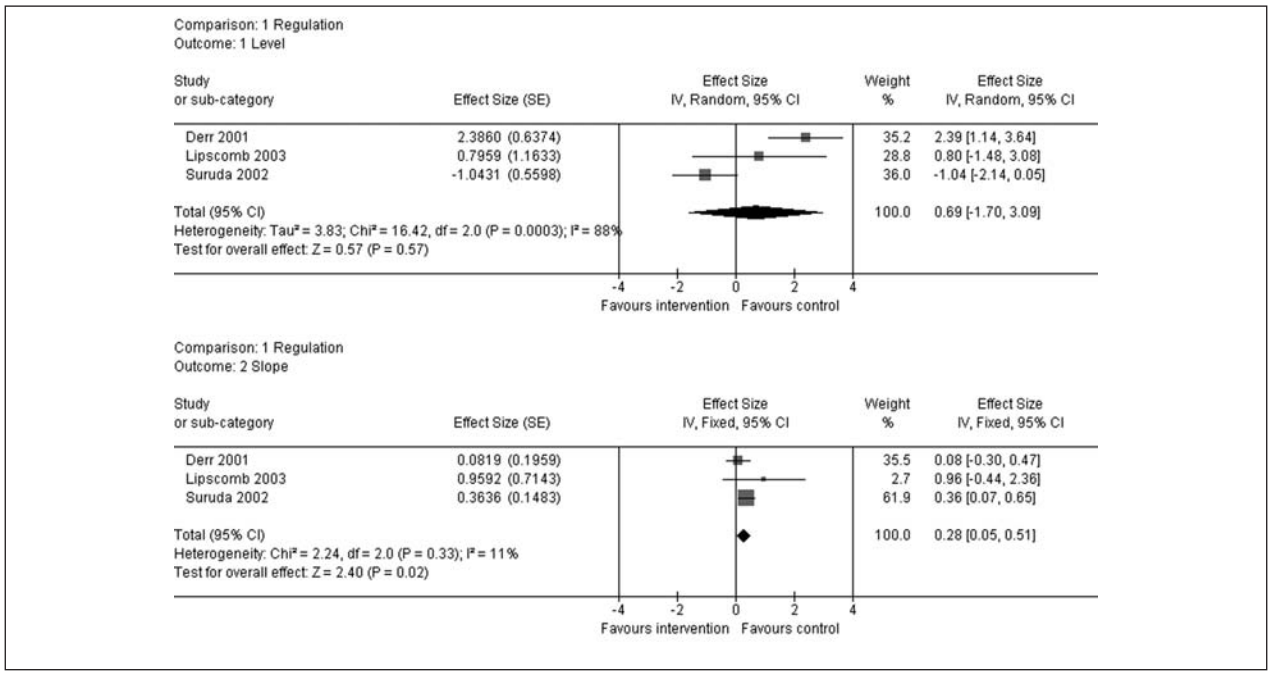

Figure 2 - Meta-analysis of the regulatory interventions with interrupted time-series design. Outcomes are reported as effect sizes and SE for A Level: describes the immediate effect of an intervention on annual injury rate, and for B Trend: describes the long-term effect of an intervention on the annual injury rate. (Reprinted from (17) with permission from Elsevier American Journal of Preventive Medicine, 35 (1)

Figura 2 *- Metanalisi degli interventi normativi con disegno a serie temporale interrotta. I risultati sono indicati in termini di dimensioni di effetto e SE per livello A: descrive l'effetto immediato di un intervento sull'incidenza annuale degli infortuni, e per Trend B: descrive l'effetto a lungo termine di un intervento sull'incidenza annuale degli infortuni. Da: 17 con l'autorizzazione di Elsevier*

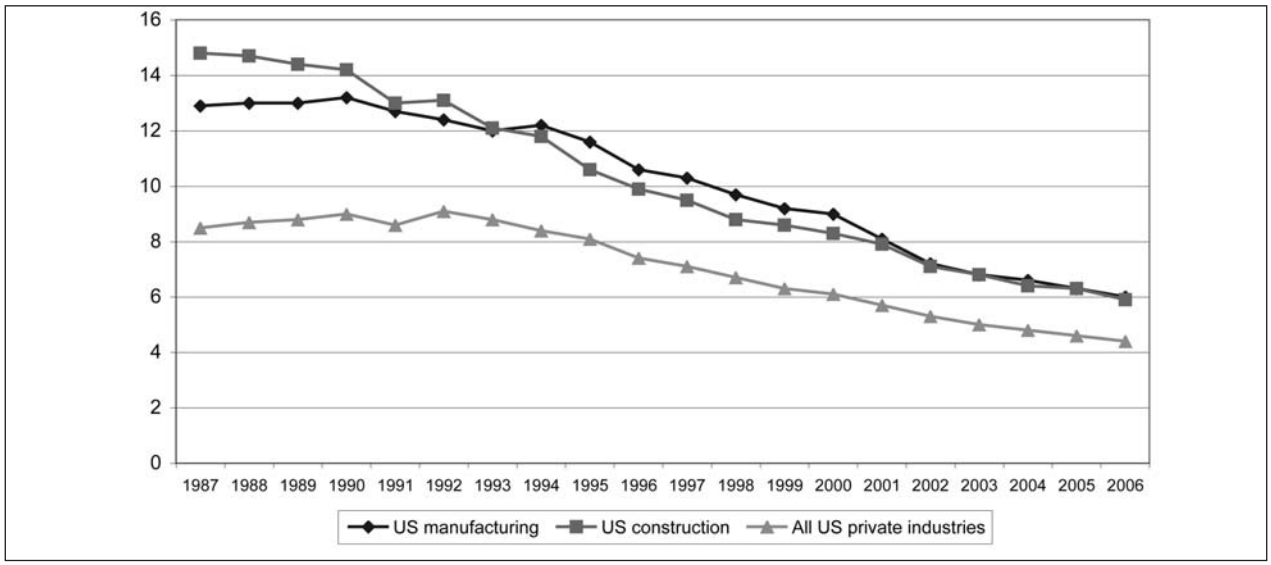

Figure 3 - Injury rates per 100 full time equivalents for the manufacturing, construction and private industry in USA over 1987 – 2006 (data adapted from BLS 2008)

Figura 3 *- Incidenze di infortuni per 100 equivalenti a tempo pieno per le industrie manifatturiere, edili e private negli USA nel periodo 1987-2006 (dati adattati da BLS 2008)*

downward change in level or trend of injuries after the start of the intervention although two studies reported a statistically significant intervention effect.

One study (27) from Denmark evaluated the effect of a multifaceted safety campaign aimed at promoting positive attitudes toward safety and at promoting behavioural safety aspects at work. The study showed an upward trend of injuries over time pre- intervention. Results of the re-analysis showed an initial intervention reduction of 3.75 non-fatal injuries per 100 person-years and a sustained effect of the intervention of 2.67 reduction in non-fatal injuries per 100 person-years per year.

One study (29) from USA showed a significant initial intervention effect of a drug-free workplace programme with a non-fatal injury rate difference of 7.59 per 100 person-years between the intervention and control group after a re-analysis. The study had a downward trend of injuries over time pre-intervention. A sustained effect of the intervention was observed, with an injury rate difference of 1.97 per 100 person-years per year between the intervention and control group.

Step 6 Interpreting results

The ultimate goal of step six is to help people to understand the implications of the evidence in relationship to practical decisions. The strength of evidence and applicability of the results are, amongst other considerations, important issues to discuss. Also variation in compliance of participants and/or providers of the intervention need to be discussed. Authors should state exactly what further research is needed and why this additional research is necessary for reaching conclusions about implications for research (7, 8).

Concerning the studies included in the CSR in the construction industry there appears to be a need for additional strategies to maximise the compliance of employers and workers with the safety measures as prescribed by regulations. Multifaceted and continuing interventions, such as a targeted safety campaign or a drug-free workplace programme, may be effective in reducing injuries in the longer term. Trying to influence the safety culture and the enforcement of the implementation of safety measures at worksites among management and construction workers appear to be important activities in these multifaceted interventions.

No studies were retained, using the Cochrane criteria, that evaluated the vast majority of technical and human factors and organisational interventions which are recommended by standard texts of safety, safety consultants and safety courses. Consensus-based literature is also excluded. This does not mean that these interventions are not effective, it means only that there is no proof available as to whether they are or are not. Future research in this area should focus on more (randomized) controlled trials or interrupted time series while taking into account: (1) defining indicators for evaluating the implementation of the intervention, (2) implementing the interventions in the best possible way, (3) measuring the behavioural change of workers as a direct result of the intervention process, (4) measuring fatal and non-fatal injuries as main outcome variables for evaluating the effectiveness of the intervention, and (5) testing the association of behavioural changes with the main outcome measures.

Discussion

Obviously, the strength of a Cochrane review lies in the fact that only studies with a powerful study design are accepted. Systematic reviews of the effects of the interventions to improve health focus on reports from randomized controlled trials (RCTs), because it is generally accepted that this study design will lead to the most reliable estimates of effects. RCTs minimize the chance that the incidence of confounding variables will differ between the control and intervention groups (16). However, through the exacting demands of medical epidemiology randomized controlled studies of the effects of drugs, surgery and other treatment are a commonplace.

Critics of systematic reviews have pointed out that there are many practical factors in occupa-

tional safety and health that substantially limit the opportunities for RCTs. Work, and especially construction work, takes place in an environment that undergoes many changes and therefore it is difficult to attribute the effects of a study solely to the intervention. Further, within individual workplaces it is rarely possible to divide the workforce into intervention and control groups, and it is often even more difficult to randomly assign subjects to either intervention or control group (2). It is very difficult, if not impossible, to maintain stable conditions, i.e., no other changes are taking place, especially for the control group. Finally, given the limited budgets for occupational safety and health research and the range of issues that need to be addressed, RCTs would use a disproportional part of these small budgets. Critics point out that there are other study designs such as a wide variety of quasi-experimental and qualitative research methods available. Further, benchmarking (comparing the results of an intervention across groups, such as different industries) and triangulation of the findings, from different, but related intervention studies should be used more often.

The authors in part agree with this criticism. It is true that it is difficult to convince employers that randomisation is necessary to obtain unbiased results also in occupational health and safety research and therefore RCTs are difficult to conduct in practice. However, lower quality study designs make it more difficult to attribute effects to a specific intervention because they allow for many known and unknown confounding factors to influence the results of a study. It is the unique strength of a CSR that only studies with the stronger study designs are accepted, in order to minimize the effects of the many known and unknown confounding factors. However, also systematic reviews are retrospective studies with potential for bias, particularly publication bias, and should also be subjected to methodological and reporting quality criteria (26).

Apparently, in the field of occupational health and safety it is more difficult to randomise participants than in clinical studies. Cluster-randomised studies (e.g. 13) and prospective cohort studies in which participants are not randomised but deliberately allocated to the control group can provide valuable alternatives. Moreover, in studies of injuries, it is quite common that the outcome is automatically registered based on an obligation of the employer to notify or report all injuries of a certain type that occur. Therefore, interrupted time-series can also be a eligible study design as shown in the CSR of the construction industry.

For research, the case of the construction industry shows that there is a clear need for (randomized) controlled or interrupted time series studies conducted over several years as a means of evaluating the effectiveness of safety interventions. Only five studies met the inclusion criteria for study design and even those studies were not of particularly high quality. Therefore, researchers, practitioners and policy makers should pay more attention to improving their evaluation work or justify why their studies and reports should be taken more seriously by Cochrane systematic reviews. The results of before-after studies or retrospective studies can give information about the potential effect and the feasibility of the intervention, but not about the effectiveness. Measuring the behavioural change of workers throughout the intervention process could enhance the usability of the before–after studies. Together with the surveillance of injury rates and frequencies, this provides a better insight into how the intervention works (25) before a (randomized) controlled study or ITS is performed.

In conclusion, the Cochrane handbook for systematic reviews of interventions provides a practical and feasible six-step framework for developing and reporting a systematic review for preventive interventions. The literature that is retained can be relied on with a high degree of confidence. The case of the construction industry showed five intervention studies that met the strict inclusion criteria and, combined with the results after re- and meta-analysis, gives evidence-based information about the level of effectiveness of the interventions to prevent injuries in the construction industry. Currently, systematic reviews originating from the Cochrane Collaboration provides one of the highest standards for knowledge about the effectiveness

of interventions for preventing work-related diseases and injuries.

NO POTENTIAL CONFLICT OF INTEREST RELEVANT TO THIS ARTICLE WAS REPORTED

REFERENCES

1. ARNDT V, ROTHENBACHER D, DANIEL U, et al: All-cause and cause specific mortality in a cohort of 20000 construction workers; results from a 10-year follow-up. Occupational and Environmental Medicine 2004; *61*: 419-425
2. BAKER R, BROCKHAUS A, BOUCIER D, et al: Letter to the Editor: May 2000 Supplement on preventing occupational injuries. American Journal of Preventive Medicine 2001; *20*: 308-309
3. BAKER SP, O'NEILL B, KARPF RS: The injury fact book. Lexington, MA: Lexington Books, 1984
4. BECKER P, FULLEN M, AKLADIOS M, et al: Prevention of construction falls by organizational intervention. Injury Prevention 2001; *7* (suppl 1): i64–7.
5. BUREAU OF LABOR STATISTICS (BLS): Injuries, illnesses, and fatalities. Retrieved September 24 2008, from http://www.bls.gov/iif/home.htm
6. CAMPBELL M, FITZPATRICK R, HAINES A, et al: Framework for design and evaluation of complex interventions to improve health. Brit Med J 2000; *321*: 694-696
7. COCHRANE COLLABORATION: *Cochrane handbook for systematic reviews of interventions, version 4.2.5*. Higgins JPT, Green S (eds). Cochrane Collaboration, 2005: 1-257
8. COCHRANE COLLABORATION: *Cochrane handbook for systematic reviews of interventions*, version *5.0.0*. Higgins JPT, Green S (eds). Cochrane Collaboration, 2008: browsable version http://www.cochrane-handbook.org/
9. EPOC(COCHRANE EFFECTIVE PRACTICE AND ORGANISATION OF CARE GROUP): *Including interrupted time series (ITS) designs in a EPOC Review. EPOC methods paper.* Ottawa ON, Canada: EPOC, 2006. www.epoc.uottawa.ca/inttime.pdf
10. DARRAGH AR, STALLONES L, BIGELOW PL, et al: Effectiveness of the HomeSafe pilot program in reducing injury rates among residential construction workers, 1994–1998. Am J Ind Med 2004; *45*: 210-217
11. DERR J, FORST L, CHEN HY, et al: Fatal falls in the U.S. construction industry, 1990 to 1999. J Occup Environ Med 2001; *43*: 853-860
12. DOWNS SH, BLACK N: The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. J Epidemiol Community Health 1998; *52*: 377-384
13. GILBODY S, BOWER P, TORGERSON D, et al: Cluster randomized trials produced similar results to individually randomized trials in a meta-analysis of enhanced care for depression. Journal of clinical epidemiology 2008; *61*: 160-168
14. HASLAM RA, HIDE SA, GIBB AGF, et al: Contributing factors in construction accidents. Applied Ergonomics 2005; *36*: 401-415
15. HULSCHER M, WENSING M, GROL R: *Effectieve implementatie: theorieën en strategieën. (Effective implementation: theories and strategies).* Den Haag: ZON/WOK, 2000
16. LACHIN JM, MATTS JP, WEI LJ: Randomization in clinical trials: Conclusions and recommendations. Controlled Clinical Trials 1998; *9*: 365-374
17. LEHTOLA MM, VAN DER MOLEN HF, LAPPALAINEN J, et al: The effectiveness of interventions for preventing injuries in the construction industry. Am J Prev Med 2008; *35*: 77-85
18. LIPSCOMB HJ, LI L, DEMENT J: Work-related falls among union carpenters in Washington State before and after the Vertical Fall Arrest Standard. Am J Ind Med 2003; *44*: 157-165
19. VAN DER MOLEN HF, LEHTOLA MM, LAPPALAINEN J, et al: Interventions for preventing injuries in the construction industry'. (Protocol). Cochrane Database of Systematic reviews 2006, Issue 4. Art. No.:CD006251. DOI: 10.1002/14651858. CD006251
20. VAN DER MOLEN HF, LEHTOLA MM, LAPPALAINEN J, et al: Interventions for preventing injuries in the construction industry. Cochrane Database of Systematic Reviews 2007, Issue 4. Art. No.: CD006251. DOI: 10.1002/14651858.CD006251.pub2
21. NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS 2002). http://www.census.gov/epcd/www/naics.html [accessed 27.02.2006]
22. PEDEN M, MCGEE K, SHARMA G: *The injury chartbook: a graphical overview of the global burden of injuries.* Geneva: World Health Organization, 2002
23. RAMSAY C, GRIMSHAW J, GRILLI R: *9th Annual Cochrane Colloquium, Lyon*, France. Lyon: 2001
24. RAMSAY CR, MATOWE L, GRILLI R, et al: Interrupted time series designs in health technology assessment: lessons from two systematic reviews of behavior change strategies. Int J Technol Assess Health Care 2003; *19*: 613-623
25. ROBSON LS, SHANNON HS, GOLDENHAR LM, et al: *Guide to evaluating the effectiveness of strategies for preventing work injuries: how to show whether a safety inter-*

vention really works. DHHS (NIOSH) Publication No. 2001–119. Cincinnati OH: CDC DHHS, National Institute for Occupational Safety and Health, 2001

26. SHEA BJ: *Assessing the methodological quality of systematic reviews. The development of AMSTAR*. Thesis. Amsterdam: Vrije Universiteit, 2008
27. SPANGENBERG S, MIKKELSEN KL, KINES P, et al: The Construction of the Oresund link between Denmark and Sweden: the effect of a multifaceted safety campaign. Saf Sci 2002; *40*: 457-465
28. SURUDA A, WHITAKER B, BLOSWICK D, et al: Impact of the OSHA trench and excavation standard on fatal injury in the construction industry. J Occup Environ Med 2002; *44*: 902-905
29. WICKIZER TM, KOPJAR B, FRANKLIN G, et al: Do drug-free workplace programs prevent occupational injuries? Evidence from Washington State. Health Serv Res 2004; *39*: 91-110