

# The Occupational Health Field in the Cochrane Collaboration<sup>a</sup>, \*

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**Abstract:** It is the aim of the Cochrane Collaboration to gather, summarise and disseminate evidence of health care interventions. Recently, the Occupational Health Field has started to do so for occupational health interventions. In this article we would like to describe the organisation and the methods used by the Field. First, the use of research information to improve the quality of occupational health practice is explained. Next, the process and contents of Cochrane Reviews are described. The pros and cons of Cochrane Reviews are listed and what occupational health practitioners can learn from it. There is a great variety of occupational health interventions that requires flexibility in which research design to use. The Occupational Health Field will enhance our understanding of the effectiveness of occupational health interventions in the coming years.

**Key words:** Systematic reviews, Cochrane Collaboration, Methodology, Intervention studies

## Introduction

Scientific knowledge has always played a large role in occupational health. Discovery of factors hazardous to health has usually led to calls on governments to better regulate the health risks at work. For evaluation of these preventive measures it has been relied on health surveillance especially the surveillance of occurrence of occupational diseases<sup>1</sup>. The time trends in these surveillance systems show generally a downward trend. However, these trends are not easy to interpret, because over time many confounders and causal factors are changing, such as a decrease in the number of persons employed in industry and an increase in the service sector<sup>2,3</sup>. As an evaluation method of the effectiveness of occupational health interventions it is rather crude. Moreover, it is impossible to find out the most efficient way of decreasing the risk. To that end comparative evaluation studies are needed. For some occupational diseases such as noise induced hearing loss, there has been a downward time trend, but the absolute level of diseases is still among the

most prevalent of all occupational diseases. That is a peculiar finding that calls for better and more systematic evaluation methods. It is the aim of the Occupational Health Field in the Cochrane Collaboration, a network of researchers and practitioners in occupational health, to collect and summarise evaluation studies of occupational health interventions and to disseminate the results in the form of systematic reviews. The objective of this article is to describe the organisation and methods used by the Cochrane Occupational Health Field.

I will first give an example of how we can use evidence to improve the quality of occupational health practice based on the approach of evidence-based medicine<sup>4</sup>. Then I will describe the process of making a Cochrane Systematic Review. Next I will indicate the pro's and con's of Cochrane Systematic Reviews for Occupational Health. I will end with an overview of Cochrane Reviews that can be used already, those that on their way and those that are still there as a wish list.

## How to Best Promote Hearing Protection

In practice, as occupational health professionals, we are confronted with workplaces with high noise levels.

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According to the hierarchy of controls we would try to convince the employer that better machinery or equipment that produces less noise would be the solution to this problem<sup>5</sup>). However, due to economic constraints, this is apparently not possible, since noise is still reported as a very prevalent risk factor in most countries. This leaves us in many cases with the promotion of hearing protection as the best way of preventing noise-induced hearing loss. There are many possible ways of doing so. What we need is an intervention that is effective in changing workers' health behaviour in such a sense that they will better protect themselves. Some advocate that this should be done with audiometry, others advocate the use of evoked-potentials to this end. As a practitioner you would have to decide how best to do so. This is where the ideas of Evidence-based medicine comes in. According to Evidence-based medicine principles, decisions in practice can be best based on the integration of clinical expertise, patient preferences and evidence from evaluation studies<sup>6</sup>). Provided that we know what our clients want and that we are experienced occupational health professionals, we only need to find out about the evidence. Thanks to revolutionary changes in medical informatics and the Internet, we can now retrieve essential medical information through any computer with access to the Internet. Accessing the medical database Medline can now be done free of charge through the Internet address [www.pubmed.gov](http://www.pubmed.gov). Provided we would have some experience in searching, we would be able to retrieve several studies in which interventions to promote the wearing of hearing protection have been evaluated. For example the randomised controlled trial of Lusk shows that elaborated health promotion campaigns did not increase the level beyond the 80% of workers that were already wearing hearing protection, comparable to the results of simple standard methods<sup>7</sup>). In addition, the study of Knobloch shows that extensive occupational health and safety information at agricultural schools can increase the wearing of hearing protection from about 20% to 80% compared to schools without such campaigns<sup>8</sup>). This would mean that in occupational health we should focus more on students at vocational schools. Moreover, it means that better and more research is needed to find effective interventions to promote hearing protection among the 20–30% of workers that ought to but that don't wear hearing protection. Physicians can find evidence for many different occupational health interventions in this way. We showed that for a variety of occupational health problems evidence is available and can be used by occupational physicians in practice<sup>9</sup>). However, it is time consuming to go through the results of primary

research as a practicing physician. This is one of the reasons that the task of gathering and summarising existing evidence in the form of systematic reviews is so important. Together with colleagues from Brazil, we recently completed a review about interventions to enhance the wearing of hearing protection. Basically, the same information as provided here is covered in the review<sup>10</sup>). In addition, the review showed that in spite of a comprehensive search only few evaluation studies were available.

Therefore, one may wonder if evidence is available for other occupational health interventions. To that end we systematically searched two volumes of 19 occupational health and general medical journals to locate occupational health intervention studies. Out of around 11,000 articles published in these journals we found 149 occupational health intervention studies. They had used all kinds of evaluation designs such as evaluating the outcome in a patient series, measuring the outcome before and after the intervention without a control group or a randomised controlled trial. However more than half were randomised controlled trials or before-after study with a control group, which we rated as good methodological quality. All occupational health outcomes were addressed, ranging from exposure to disability and occupational diseases. Therefore, we concluded that not only the method is feasible but that also the scientific evidence is available in the literature for occupational health interventions<sup>11</sup>).

## What are Cochrane Systematic Reviews?

Archie Cochrane, a British epidemiologist was the first to see the need for systematic reviews to improve the quality of health care<sup>12</sup>). His ideas are taken on by the Cochrane Collaboration that has started producing and disseminating systematic reviews on the effects of health care about fifteen years ago. To date, there are about 2,500 systematic reviews in the Cochrane Library that is available through the Internet at [www.cochrane.org](http://www.cochrane.org). Systematic reviews are defined as literature reviews that have been prepared by using a systematic approach to minimise bias and random error which is documented in the methods section<sup>13</sup>). In practice this means that they have a clearly stated question, a systematic and comprehensive search of the literature, and a controllable way of synthesizing the studies found.

The method of making systematic reviews has been elaborated in the Cochrane Collaboration<sup>14</sup>). The Cochrane Handbook for systematic reviews can be regarded as a quality system. Following the rules set by the Cochrane Collaboration ensures that the reviews are of high quality. There is evidence

from empirical research that confirms this<sup>15</sup>).

The writing of a Cochrane Review is a three step process. First, the title has to be registered to avoid duplication. Next, a protocol has to be written and accepted by the appropriate review group to ensure a systematic approach. The protocol is a real research protocol in which details about the background, the research question, the types of studies to be included and the methods to synthesize studies should be described. The third step involves carrying out the protocol and writing the review. The review will be finally published in the Cochrane Library through the Internet and in many cases it can be reformulated as a publication in a paper journal.

Thus far, Cochrane systematic reviews have dealt only with the effectiveness of interventions. In a systematic review, there should always be a clearly formulated question underlying a review preferably formatted according to the PICO acronym<sup>9</sup>). The P stands for the population or type of patients at which the intervention is targeted. Then, obviously, the Intervention of interest should be defined. Next, there has to be a definition of the Comparison group against which the outcome in the intervention group will be compared. Finally, you have to state in advance what the Outcome is in which you are interested or by which you will measure the effectiveness. This will result in questions like: 'Is advice for manual material handling effective in preventing or treating back pain in workers?'

A systematic review requires the definition of clear inclusion and exclusion criteria for the studies. This does not only relate to the PICO features, but also to the types of study design. In addition, the assessment and reporting of methodological quality is a required aspect of every Cochrane Review.

A comprehensive search strategy is a logical result of using a structured approach. The inclusion criteria have to be transformed into search words that can be used to locate studies of interest in electronic databases such as Medline. Next, one has to select manually the studies that fulfil all inclusion criteria.

The methods for summarizing the studies can be either quantitative as in a meta-analysis, or qualitative in the form of levels of evidence<sup>14</sup>).

## What Can Occupational Health Learn from the Cochrane Collaboration?

In occupational health care, as in other preventive specialties, there is a tendency to justify preventive activities as good in themselves. The line of thinking then is that if there are work-related health risks, then everything should

be done to try to avoid them. However, all interventions use resources which can not be spent on something else and some interventions can do more harm than good. An example of this is debriefing to prevent post-traumatic stress syndrome. Debriefing has long been considered an intervention that could prevent stress symptoms. Good evaluation studies with well posed questions and systematic reviews of these studies have nevertheless shown that in fact the opposite is true. Debriefing can actually induce post-traumatic stress syndrome and does not prevent it<sup>16</sup>). Well posed questions can help to avoid confusion about prevention. It forces us to think about how the intervention that we apply might work, and what kind of outcome we would like to decrease or increase.

A common criticism of the Cochrane Collaboration is that it is too restrictive in the use of research designs, most often restricted to randomized controlled trials. Especially in the area of occupational health it can be very difficult or even impossible to use a randomized design. This raises many interesting questions. If a randomized design is not appropriate for studying occupational health, then what is? We think that the study design is not related to the setting but rather to the type of intervention that is applied. Clinical interventions are usually applied at the individual level and yield only minor to moderate effects. The use of methodologically weaker designs can easily lead to bias that completely distorts small effects. This is a strong incentive to randomize individuals, since randomization has been shown to best prevent bias<sup>17</sup>). However, interventions that aim at changing the work environment, such as eliminating exposure to noise are usually applied at the group level. Even though it is possible to randomize groups, this is more difficult. In the case of regulations or policy changes as an intervention, the level of application is a whole country or an entire population. Even though in theory it would be possible to randomize there, in practice this is impossible. In these cases, it is obvious that we would need research designs that differ from randomized controlled trials.

Are all interventions focusing on occupational health different from those in the clinical setting? This implies that we need more and better knowledge about occupational health interventions. It can easily be shown that we apply a wide variety of interventions at different levels. Many return-to-work interventions are individual directed and do not differ much from an ordinary clinical intervention. We feel that randomized designs are needed to evaluate these interventions<sup>18,19</sup>). Interventions aimed at decreasing exposure can be randomized at the workplace level. In this case, not the individuals but groups of individuals are randomised

such as departments or firms. For example six firms could be randomly assigned to either the intervention or the control group, which minimises the risk of bias in a similar way as in a randomised controlled trial. This is called a cluster-randomised or group randomised trial. In a study advising employers about reducing wood dust exposure, researchers were able to use a cluster randomized design. They were surprised to find much smaller reductions in wood dust than they anticipated<sup>20</sup>. We feel that this should be a strong incentive to use this design in the evaluation of environmental interventions.

The question then remains, how to evaluate policy measures and national regulations. At this level, it would be difficult or impossible to organise a control group and impossible to randomise participants or groups. The interrupted time-series design could be feasible here. In such a design, the outcome is measured several times before the intervention and several times after the intervention. Evidence for effectiveness is then that the intervention brings about a clear change in the trend of the outcome over time<sup>21</sup>. However, there is little experience in using these designs and it is not easy to summarize their outcomes over studies.

## What Reviews are There in the Cochrane Library?

Schonstein recently gave a nice overview of the occupational health reviews that are already in the Cochrane Library<sup>22</sup>. There is a diversity of reviews ranging from interventions for back pain to vaccination for hepatitis B. It is clear that many typical occupational health topics are still lacking such as noise reduction, chemical exposure reduction, return to work strategies, stress prevention. The Cochrane Occupational Health Field works hard to catch up. At the moment there are about ten occupational health reviews on its way ([www.cohf.fi](http://www.cohf.fi)). It is expected that they will be finished in the course of 2006 and 2007. This will greatly increase our knowledge of the effectiveness of occupational health interventions.

## Conclusion

Research on health risks has greatly improved health and safety at work. To further improve workers' health better interventions are needed in many areas. This has increased the need for evaluation and knowledge about effectiveness.

The systematic approach of the Cochrane Collaboration can be applied to a great part of occupational health interventions. Applying the Cochrane methodology to the

area of occupational health raises many interesting questions either about the methodology or about the alternatives. Finding answers to these questions is a challenge for all those involved in occupational health.

The Cochrane Occupational Health Field will contribute substantially to the synthesis of research information in the occupational health area. We would like to call on all involved in occupational health to participate and contribute to this valuable base of evidence for the effectiveness of occupational health interventions.

## References

- 1) Verma DK, Purdham JT, Roels HA (2002) Translating evidence about occupational conditions into strategies for prevention. *Occup Environ Med* **59**, 205–13.
- 2) Fabiano B, Curro F, Pastorino R (2001) Occupational injuries in Italy: risk factors and long term trend (1951–98). *Occup Environ Med* **58**, 330–8.
- 3) Steenstra IA, Verbeek JH, Prinsze FJ, Knol DL (2006) Changes in the incidence of occupational disability as a result of back and neck pain in the Netherlands. *BMC Public Health* **6**, 190.
- 4) Verbeek J, van Dijk F (2006) A practical guide for the use of research information to improve the quality of occupational health practice. In: *Protecting workers' health*, Verbeek J and van Dijk F (Eds.), 7, 1–72, WHO, Geneva.
- 5) Roelofs CR, Barbeau EM, Ellenbecker MJ, Moure-Eraso R (2003) Prevention strategies in industrial hygiene: a critical literature review. *AIHA J* **64**, 62–7.
- 6) Sackett DI, Straus SE, Richardson WS, Rosenberg W, Haynes RB (2000) *Evidence-based medicine; how to practice and teach ebm*, 2nd Ed., Churchill Livingstone, Edinburgh.
- 7) Lusk SL, Ronis DL, Kazanis AS, Eakin BL, Hong O, Raymond DM (2003) Effectiveness of a tailored intervention to increase factory workers' use of hearing protection. *Nurs Res* **52**, 289–95.
- 8) Knobloch MJ, Broste SK (1998) A hearing conservation program for Wisconsin youth working in agriculture. *J Sch Health* **68**, 313–8.
- 9) Verbeek JH, van Dijk FJ, Malmivaara A, Hulshof CT, Rasanen K, Kankaanpaa EE, Mukzla K (2002) Evidence-based medicine for occupational health. *Scand J Work Environ Health* **28**, 197–204.
- 10) El Dib RP, Verbeek J, Atallah AN, Andriolo RB, Soares BG (2006) Interventions to promote the wearing of hearing protection. *Cochrane Database Syst Rev* **2**, CD005234.
- 11) Ruotsalainen JH, Verbeek JH, Salmi JA, Jauhiainen M, Laamanen I, Pasternack I, Husman K (2006) Evidence on the effectiveness of occupational health interventions. *Am J Ind Med* **49**, 865–72.
- 12) Cochrane AL (2003) *Effectiveness and efficiency, random reflections on health services* (reprint), Royal Society of Medicine Press Ltd, London.

- 13) Egger M, Smith GD, O'Rourke K (2001) Rationale, potentials, and promise of systematic reviews. In: *Systematic reviews in health care; meta-analysis in context*, 2nd Ed., Egger M, Smith GD and Altman DG (Eds.), 3–22, BMJ, London.
- 14) Higgins JPT, Green S (Eds.) (2005) *Cochrane Handbook for Systematic Reviews of Interventions* 4.2.5, John Wiley & Sons Ltd, Chichester, UK.
- 15) Olsen O, Middleton P, Ezzo J, Gotzsche PC, Hadhazy V, Herxheimer A, Kleijnen J, McIntosh H (2001) Quality of Cochrane reviews: assessment of sample from 1998. *BMJ* **323**, 829–32.
- 16) Rose S, Bisson J, Churchill R, Wessely S (2002) Psychological debriefing for preventing post traumatic stress disorder (PTSD). *Cochrane Database Syst Rev* 2, CD000560.
- 17) Kunz R, Oxman AD (1998) The unpredictability paradox: review of empirical comparisons of randomised and non-randomised clinical trials. *BMJ* **317**, 1185–90.
- 18) Schonstein E, Kenny D, Keating J, Koes B, Herbert RD (2003) Physical conditioning programs for workers with back and neck pain: a cochrane systematic review. *Spine* **28**, E391–5.
- 19) Verbeek JH (2006) How can doctors help their patients to return to work? *PLoS Med* **3**, e88.
- 20) Lazovich D, Parker DL, Brosseau LM, Milton FT, Dugan SK, Pan W, Hock L (2002) Effectiveness of a worksite intervention to reduce an occupational exposure: the Minnesota wood dust study. *Am J Public Health* **92**, 1498–505.
- 21) Grilli R, Ramsay C, Minozzi S (2002) Mass media interventions: effects on health services utilisation. *Cochrane Database Syst Rev* 1, CD000389.
- 22) Schonstein E, Verbeek JH (2006) Occupational health systematic reviews: an overview. *Work* **26**, 255–8.