Papers and manuscripts based on the studies presented in this thesis

Chapter 2

Elders LAM, Burdorf A. Prevalence, incidence, and recurrence of low back pain in scaffolders during a three year follow-up study. Spine, accepted.

Chapter 3

Elders LAM, Burdorf A. Interrelations of risk factors of low back pain in scaffolders. Occup Environ Med 2001;58:597-603.

Chapter 4

Molano SM, Burdorf A, Elders LAM. Factors associated with medical care-seeking due to low-back pain in scaffolders. Am J Ind Med 2001;40:275-281.

Chapter 5

Elders LAM, Heinrich J, Burdorf A. Risk factors for sickness absence because of low back pain among scaffolders: a 3-year follow-up study. Spine 2003;28:1340-1346.

Chapter 6

Elders LAM, Burdorf A, Öry FG. Ethnic differences in disability risk between Dutch and Turkish scaffolders. Submitted. Also published as: Elders LAM, Burdorf A, Öry FG. Verschillen in WAO-toetreding tussen Turkse en Nederlandse steigerbouwers. TSG 2002;80:305-310.

Chapter 7

Elders LAM, Van der Beek AJ, Burdorf A. Return to work after sickness absence due to back disorders - a systematic review on intervention strategies. Int Arch Occup Environ Health 2000;73:339-348.

Chapter 8

Elders LAM, Van der Meché FGA, Burdorf A. Serratus anterior paralysis as an occupational injury in scafffolders two case reports. Am J Med 2001;40:710-713.

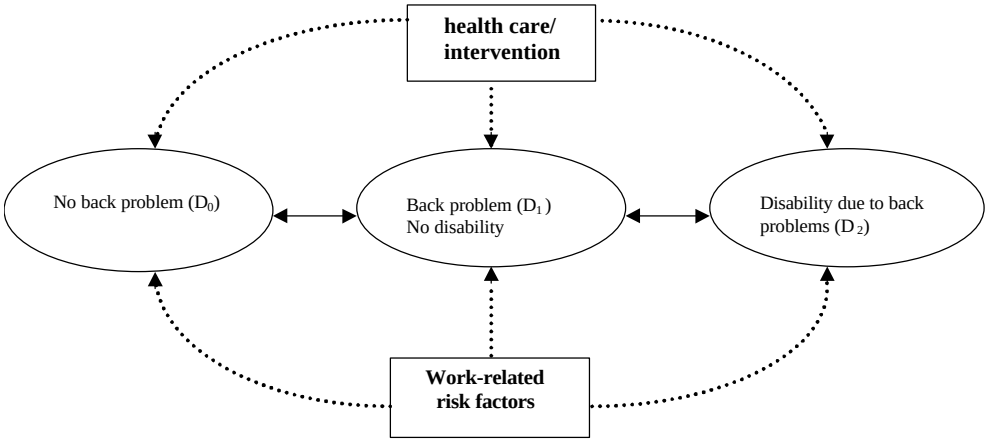
Introduction 1

Introduction

Musculoskeletal disorders, especially of the back, constitute a major health problem in many occupational populations. The one-year prevalence of low back pain may be as high as 83% at the expense of very high costs for society regarding sickness absence and disablement.[1,2] Among the factors that significantly contribute to the occurrence of back disorders are several modes of physical and psychosocial load.[3,4] The attributable fraction of physical load in the occurrence of low back pain in various working populations was estimated between 11-58%.[5] Manual handling of materials (i.e. lifting and carrying of loads), awkward back postures, and whole-body vibration have been identified as significant physical risk factors of low back pain.[5-7] Low job control and lack of social support from colleagues have been suggested as psychosocial risk factors for musculoskeletal disease.[8] However, the combined impact on the development of low back pain of various physical, psychosocial, personal, and health related risk factors within different occupational settings remains unclear.

Despite the large numbers of epidemiological studies there are clear deficiencies in knowledge about which risk factors are causal and which factors only aggravate pain or low back pain perception.[9] Hence, little is known about the interrelations of risk factors and their association with different stages of low back pain. Some risk factors may even act as dynamic modifiers of these relations as a result of a continuous alteration and changing presence of both low back pain and associated risk factors.[10] In order to better understand the interrelations between work-related risk factors, potential modifiers, and back disorders, it may be beneficial to apply a theoretical model as framework for the research presented in this thesis. Figure 1 depicts a dynamic model for low back pain.[11] This model differentiates three health grades commonly used in epidemiological research on low back pain: no back problem (D_0), back problem and no disability (D_1), and disability due to back problems (D_2). The horizontal arrow between D_0 and D_1 represents the onset of back problems from which subjects may fully recover within a few weeks. The second horizontal arrow between D_1 and D_2 symbolises the aggravation from back complaints to back disability, for example resulting in sickness absence. The return to work after a period of sickness absence due to low back pain is depicted by the change from D_2 to D_1 or D_0. In this dynamic model, the passing from one disease state to another is influenced by work related and individual risk factors which may vary according to the disease stage. The recovery from one disease state to another is also influenced by health care intervention that address the interactions between the worker, the workplace requirements, and the work load. The dynamic model assumes that workers will move through different disease stages, characterised by onset, aggravation, and recovery from back complaints.[11]

Figure 1 Dynamic model for interrelationships among risk factors, health care/interventions, and back disorders (modified model based on Burdorf et al.1997)[11]



This model illustrates also another important issue in low back pain research; the fact that onset and duration of low back pain episodes are difficult to measure since the transition, back and forth, from one stage to another stage is a dynamic process among subjects in a population. If the time of onset of LBP is not clearly defined, it is very difficult to distinguish between incidence and recurrence.[11] Hence, results from various studies on prevalence, incidence, and recurrence of low back pain are difficult to compare, often due to differences in the period of recall of the subjects under study.

Acknowledging that low back pain is a dynamic entity that can change over time, there is a clear reason for longitudinal studies that describe the dynamic pattern of low back pain episodes in a certain time window.

The vast majority of low back pain patients (90%) are expected to recover in about six weeks.[12] However, high recurrence rates of 40-70% have been reported.[13,14] In the Netherlands, musculoskeletal disorders constitute about 35% of all sickness absence, while in the United States the category accounts for 40% of all compensation claims.[15] Although, low back pain in most cases is a self limiting condition with spontaneous recovery, many workers seek some form of medical care. In one study 60% of the population sought medical care from their general practitioner, about 25% from a specialist, 15% from a chiropractor, and 52% received physiotherapy as treatment.[13]

Several other studies have demonstrated that the decision to seek medical care depends on various aspects such as severity and nature of back pain, education, age, physical load at work, psychosocial factors, and non-disabling comorbidity.[16-18] Different health care practitioners may cater for different populations of back pain patients and, consequently, may have different views on the work-relatedness of back problems. Nevertheless, different sets of risk factors for sickness absence may be associated differently with various end points of low back pain.

Therefore, some authors have suggested that prevention and treatment should focus on preventing chronicity of low back pain and disability resulting from low back pain rather than preventing the onset of pain.[19-21]

In 1998, disability benefits were paid to 13.2% of the labour force in the Netherlands, a figure that varied in the rest of Western Europe between 3.1% in Spain and 11.9% in Sweden.

In 2002 about 250.000 workers diagnosed with any form of musculoskeletal disease received a disability pension, more than 60% because of back disorders and low back pain. An elevated risk of becoming disabled can only be reduced by starting the preferred interventions at the right time. In the literature three types of occupational interventions have been described (a) organisational and administrative interventions (b) technical, engineering or ergonomic interventions and (c) personal interventions.[22] It would be of great help if stakeholders in reintegration, like general practitioners and occupational health physicians, could benefit from protocols or guidelines for various types of interventions.[23,24] Although some of these guidelines do exist they are based on consensus among general and occupational health practitioners and there is little knowledge about their effectiveness for return to work.

Objective of this thesis

The objective of this thesis was to study the occurrence of low back pain in an occupational population, with specific focus on the dynamics of low back pain complaints, sickness absence and disability due to low back pain and their relationship with work-related and personal risk factors.

The study population consisted of scaffolders working at a large scaffolding company. Scaffolders experience high levels of physical load every day. Their principal tasks are erecting and taking down large scale scaffolds. During these tasks manual handling of materials totalling between 5.000 or 15.000 kilograms every day is one of the most dominant activities. Among scaffolders sickness absence is one of the highest in the Netherlands, with an estimated 10% in 2002. Musculoskeletal disorders including injuries due to accidents are the main cause of disability. In addition, scaffolders rank among the occupations in the construction industry with the highest incidence of disability pensions.[25] Although the scaffolding company was sufficiently equipped with its own occupational health service and kept a thorough registration of sickness absence and disability, the company was not able to gain enough insight in the complex of risk factors that lead to a dramatic loss of personnel due to sickness absence and disability. Considerations about how to stop this human and economic disaster was the direct cause for this investigation.

The specific aims of this thesis are:

1. To study the dynamic character of low back pain over time and the impact of work-related risk factors on the occurrence of low back pain.
2. To study the consequences of low back pain complaints in terms of sickness absence and disability and to identify intervention strategies to successfully enhance return to work.

The results should include information on work-related risk factors and back disorders, as well as information on the role of these factors in the progression from back symptoms to disability and how this might be prevented.

Reading guidance

This thesis is divided into 3 parts. Part I (Chapters 2 and 3) provides information about prevalence, incidence, and recurrence of low back pain in scaffolders and their relationship with different risk factors. It also presents an overview of the interrelations between physical, psychosocial, individual, and health related risk factors and the association with four different endpoints of low back pain.

Part II (Chapter 4-7) elaborates on the problem of medical care seeking concerning different low back pain endpoints. It also presents information on risk factors for short-term and long-term sickness absence. Furthermore, it tries to unravel the ethnic differences in disability risk between native Dutch and Turkish scaffolders. Finally, it presents the results of a systematic review regarding the effectiveness of intervention programmes on return to work after sickness absence due to back disorders.

Part III (Chapter 8) presents an occupational injury of the shoulder caused by nerval damage after lifting and carrying weights up to 50 kilograms, resulting in disability. Preventive measures to anticipate on the aetiology of this invalidating injury are discussed.

References

1. Bovenzi M, Betta A. Low-back disorders in agricultural tractor drivers exposed to whole-body vibration and postural stress. Appl Ergon 1994;25:231-41.
2. Van Tulder MW, Koes BW, Bouter LM. A cost-of-illness study of back pain in The Netherlands. Pain 1995;62:233-40.
3. Feyer AM, Herbison P, Williamson AM et al. The role of physical and psychological factors in occupational low back pain: a prospective cohort study. Occup Environ Med 2000;57:116-120.
4. Latza U, Karmaus W, Stürmer T. Cohort study of occupational risk factors of low back pain in construction workers. Occup Environ Med 2000;57:28-34.
5. Burdorf A, Sorrock G. Positive and negative evidence for risk factors of work related back disorders. Scand J Work Environ Health 1997;23:243-56.
6. Social Europe. Europe for safety and health at work 3/93, European Commission, DGV, 1994:345.
7. Kuiper JI, Burdorf A, Verbeek JHAMet al. Epidemiologic evidence on manual materials handling as a risk factor for back disorders: a systematic review. Int J Ind Ergonom 1999;24:389-404.
8. Bongers PM, De Winter CR, Kompier MAJ, Hildebrandt VH. Psychosocial factors at work and musculoskeletal disease. Scand J Work Environ Health 1993;19:297-312.
9. Riihimäki H. Hands up or back to work- future challenges in epidemiologic research on musculoskeletal diseases. Scand J Work Environ Health 1995;21:401-3.
10. Devereux, JJ, Buckle PW, Vlachonikolis G. Interactions between physical and psychosocial risk factors at work increase the risk of back disorders: an epidemiological approach. Occup Environ Med 1999; 56:343-53.
11. Burdorf A, Rossignol M, Fathallah FA, Snook SH, Herrick RF. Challenges in assessing risk factors in epidemiologic studies on back disorders. Am J Ind Med 1977;32:142-152.

12. Waddell G.A. New clinical model for the treatment of low-back pain. Spine 1987;12:632-44.
13. Biering-Sørensen F. A prospective study of low-back pain in a general population. Occurrence, recurrence and aetiology. Scand J Rehabil Med 1983;15:71-79.
14. Clinical standards Advisory Group. Epidemiology review: the epidemiology and cost of low back pain. London: HMSO;1994.
15. College van Toezicht Sociale Verzekeringen (1998). Augustus rapportage arbeidsongeschiktheids-verzekeringen 1998. Een overzicht van ontwikkelingen tot begin 1998 Zoetermeer. College van toezicht sociale verzekeringen (CTSV).
16. Hurwitz EL, Morgenstern H. The effects of comorbidity and other factors on medical versus chiropratic care for bak problems. Spine 1997a;22:2254-64.
17. Hurwitz EL, Morgenstern H. The effects of comorbidity on care seeking for back problems in the United States. Ann Epidemiol 1999;9:262-70.
18. Josephson M, Vingard E. Workplace factors and care seeking for low-back pain among nursing personnel. MUSIC Norrtalje Study Group. Scand J Work Environ Health 1998;24:465-72.
19. Frank JW, Brooker AS, DeMaio SE, et al. Disability resulting from occupational low back pain. Part II: What do we know about secondary prevention? A review of the scientific evidence on prevention after disability begins. Spine 1996;21:2918-29.
20. Frymoyer JW, Cats-Baril W. Predictors of low back pain disability. Clin Orthop 1987:89-98.
21. Hadler NM. Regional back pain. N Engl J Med 1986;315:1090-2.
22. Zwerling C, Daltroy LH, Fine LJ et al. Design and conduct of occupational intervention studies: a review of evaluation strategies. Am J Ind Med 1997;32:164-79.
23. Faas A. Chavannes AW, Koes BW et al. HNG Standaard Lage-rugpijn. Huisarts Wet 1996;39:18-31.
24. Dutch Society of Occupational Physicians. Practice Guidelines for Low Back Pain 1999.
25. Ploeger A. Disability in the construction industry. Amsterdam: Economical Institute for the Construction Industry (EIB) 2001.