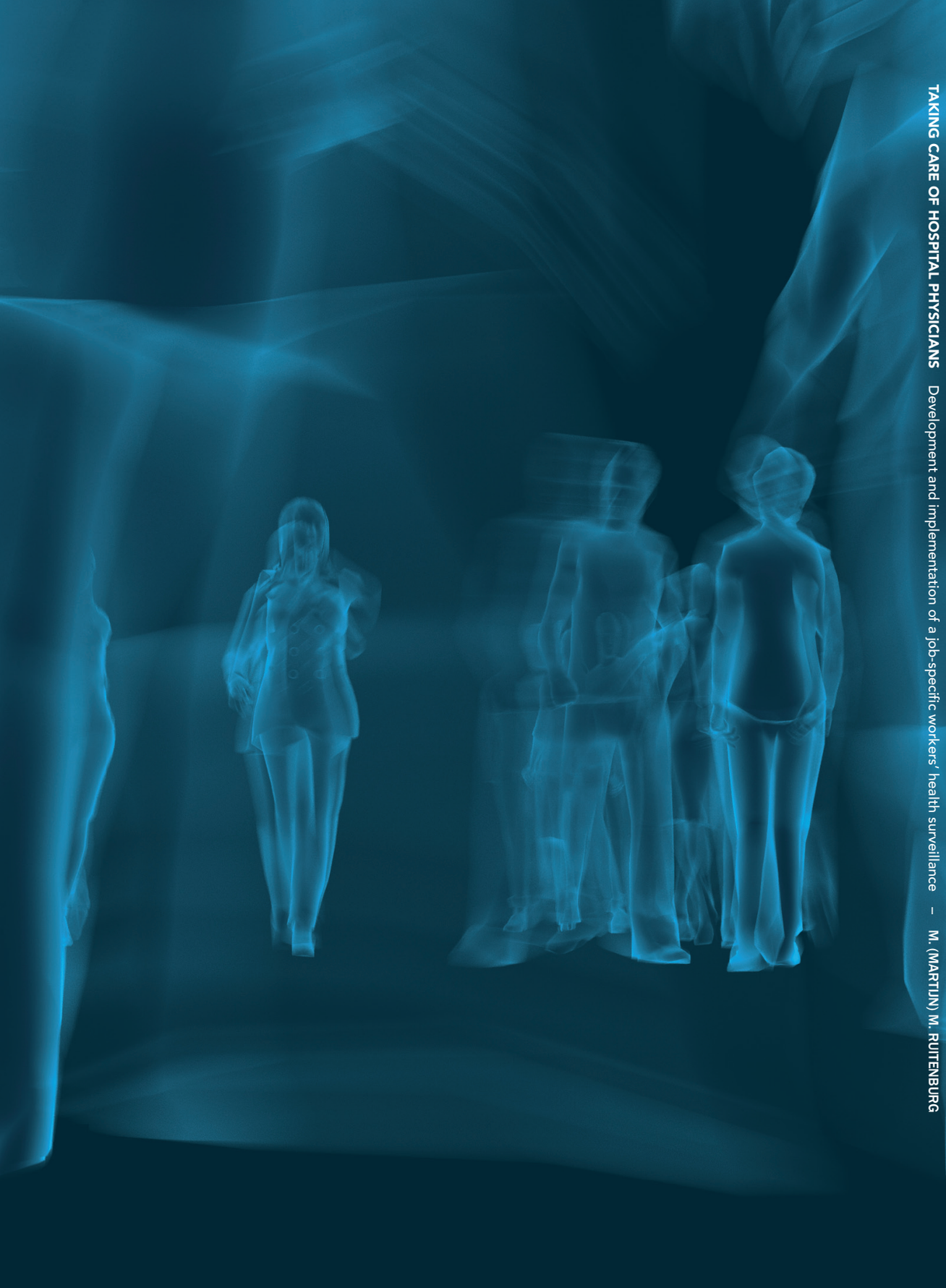
Taking care of hospital physicians: Development and implementation of a job-specific workers' health surveillance

Ruitenburg, Martijn



TAKING CARE OF HOSPITAL PHYSICIANS Development and implementation of a job-specific workers' health surveillance – M. (MARTIJN) M. RUITENBURG

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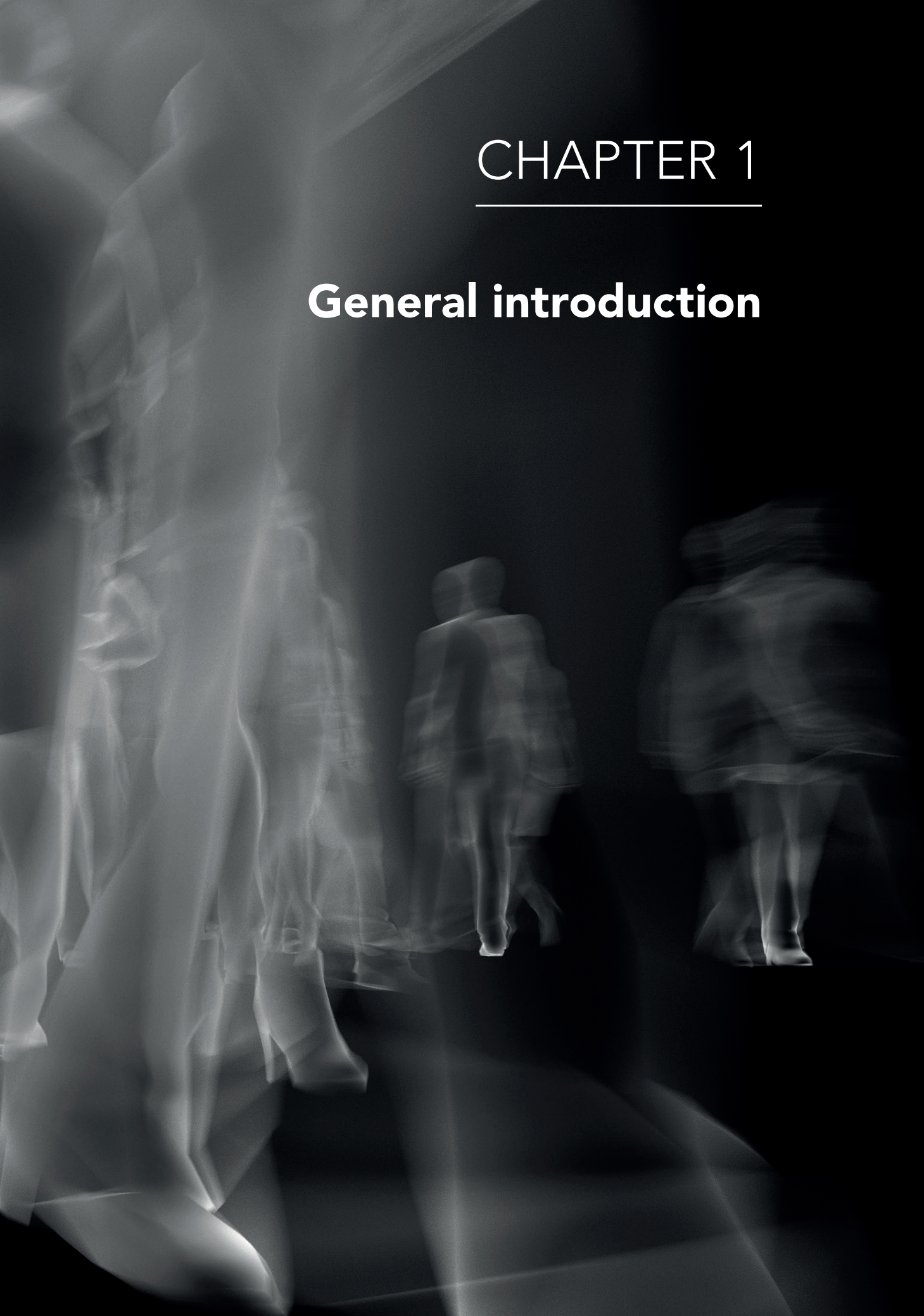

CHAPTER 1

General introduction

General introduction

Occupational healthcare: the dynamic interaction between work and the employee

The field of occupational healthcare is concerned with aspects of risk and safety in relation to the health and well-being of people engaged in work or employment.[1] The aim of occupational healthcare is to provide a safe working environment for the employees, prevent work-related diseases, allow employees with and without limitations to participate, and to improve functioning at work.[2]

With these aims in mind, occupational healthcare is founded in the assumption that a dynamic interaction occurs between the employee and his/her work (see figure 1). Work consists of characteristics that can evoke responses from an employee. These characteristics include the content of the job, the working environment (e.g. presence of chemical or biological factors), the working relations (e.g. relationships with colleagues), and the working conditions (e.g. working times, working contract or rewards).[3] The employee can decide how he or she performs the task, which is not only determined by the chosen strategy or method, but also by the decision of an employee regarding the extent to which he or she wants to deliver the same quality and quantity of output, resulting in a workload for the individual employee (arrow 1 of figure 1).[3,4] The dynamic interaction implies that whether or not the resulting workload might lead to short- or long-term health effects (arrow 2), which can lead to decreased work functioning (arrow 3), is dependent on the physical and mental capacities of the employee. When the worker's capacities are sufficient to meet the occupational demands, and the worker has sufficient opportunities to recover, he or she is able to safely perform the work without the occurrence of any adverse health effects or loss of work functioning. However, when the demands of the job exceed the worker's capacity, signs of diminished health or work functioning become visible. These can be acute or short-term signs, such as an increased heart rate, feeling tired or a change of mood, but also long-term signs like feeling extremely fatigued, showing signs of depression or having problems sleeping.[5] Depending on the duration of the excessive workload and fewer recovery opportunities, a worker might develop work-related health complaints and demonstrate a loss of work functioning.[5]

To prevent work-related health complaints and improve work functioning, one should first focus on eliminating the health risk at work by reviewing the characteristics of work.[3] For example, the introduction of ergonomic measures like hand tools in the construction industry aimed at reducing the exertion required to perform a task[6], thereby reducing the risk of developing work-related musculoskeletal disorders. In another occupation, trying to reduce the workload through job rotation among refuse collectors resulted in a decreased need for recovery.[7] However, in the case of a job consisting of so-called specific job demands, defined as occupational demands that 'exceed exposure safety levels or human capacities to meet such demands on a daily basis, leading to increased risk of work-related health problems'[8], reduction or elimination

of the risk of developing work-related health complaints by focussing on work is often not possible. In that case, occupational health strategies could focus on increasing the physical and mental capacities of the individual employee so that he or she is better able to meet the demands of the job. For example, physical exercises related to the job demands for firemen can serve to increase the physical capacities of the individual fireman to carry their materials for a period of time over a certain distance. Or, building up psychological resilience through counselling aims at improving nurses' capacities to cope with emotionally demanding situations.[9] However, caution should be taken when trying to increase the individual capacities of employees, keeping in mind that the aim is to support individual employees who lack the required health capacities that could normally be expected of an employee in a specific occupation.
Thus, occupational health strategies that aim at reducing the risk of work-related health complaints or reduced work functioning by solely focussing on occupational demands are not appropriate when specific job demands exist[8], but solely focussing on increasing the capacities of the employee might also not be sufficient or realistic to improve work functioning. When job demands cannot be changed and where a lack of the health requirements to meet these demands can put the safety and well-being of the individual employee and others at risk, occupational health strategies should perhaps focus more on early detection of diminished health or health related work functioning to prevent a loss in work functioning, as is done by a Workers' Health Surveillance (WHS).

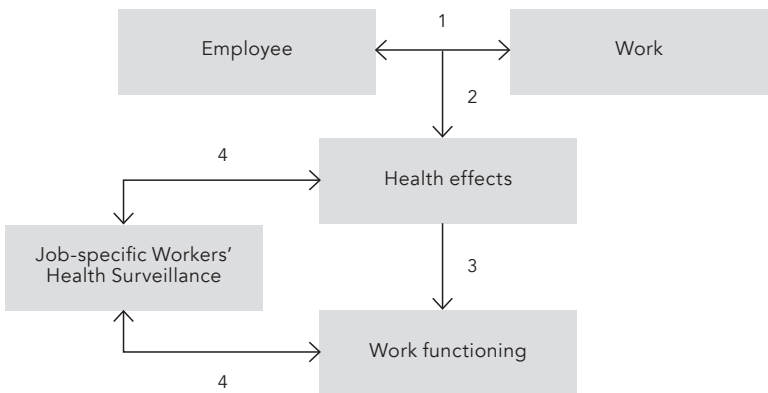

FIGURE 1 Scheme of the dynamic interaction between work and the employee, the work-related health and resulting work functioning, as well as the role of WHS.

Workers' Health Surveillance

The purpose of a Workers' Health Surveillance (WHS) is to prevent occupational and work-related diseases and injuries at the individual level.[10] A WHS aims at maintaining or improving the work-related health and work functioning of employees through the early detection of signs of diminished health or reduced work functioning (arrows 4, figure

1), as is reflected in the three goals of WHS[11]: i) to prevent the onset, recurrence and/or worsening of work-related diseases; ii) to monitor and promote an individual's health in relation to work; and iii) to monitor and promote work functioning and deployment. The first goal addresses the focus on work by aiming at detecting unfavourable occupational exposures and/or early detection of work-related health complaints. By aiming at the early detection of diminished health, leading to a reduced capacity and threatening abilities to deal with the demands of the task at hand, the second goal of the WHS puts more emphasis on the capacities of the individual employee in relation to their work. The third goal mainly concerns the work-related health of employees with respect to long-term health outcomes.

The WHS can periodically monitor the health effects and work functioning of employees and therefore serves as a strategy for maintaining good work-related health and good work ability. However, in order to achieve the goals of the WHS, the included assessments, tests and instruments should be carefully chosen and based on the specific demands and health effects of the occupation of interest.[10] Whereas historically employees were screened to gather general medical information, a job-specific approach has been advocated widely above a general approach.[10,12] In a job-specific approach, the focus is on all aspects of health and safety of the worker in a specific job. By taking this approach, it is more likely that the WHS will lead to more valid and relevant results for the monitoring of the employee's health, which increases the possibility of early detection of health effects that reduce work functioning and affect job performance.[8] In addition, a job-specific approach enables interventions that best fit the occupation of interest, thereby increasing the likelihood of effective interventions to increase work functioning, and prevents employees from having to perform an abundance of screening tests and assessments that have no value in predicting how well they perform their job.[12] Developing a job-specific approach, which requires considerable time and effort, is mainly relevant and efficient for occupations consisting of specific job demands where targeting early signs of diminished health or reduced work functioning, and initiating targeted interventions is desirable to promote safe and healthy job performance.

To create a job-specific WHS, the occupational demands as well as the health- and work functioning problems that might be related to these occupational demands, and which may pose a risk to the worker and other workers, should be investigated for the occupation of interest. The next step is to determine the health requirements based on the special demands, and the health effects that reflect a reduced capacity of the employee, after which appropriate surveillance instruments can be selected for work-related health and work functioning. In the case of early signs of reduced work-related health or loss of work functioning, preventive actions or interventions can be recommended by an occupational physician. These actions can take either the occupational health approach or the worker's health approach, i.e., either reducing occupational demands temporarily or improving health and work functioning. So far, a job-specific WHS has been developed and evaluated for fire fighters,[13] ambulance workers[14], hospital nurses[9] and for workers in the construction industry.[15] These are all high-demand jobs with specific job demands that cannot be prevented or may impose

a risk for the health, safety and work functioning of the employee and others, as is the case in healthcare. These studies have shown the job-specific WHS to be a promising strategy to maintain or increase work-related health and work functioning, for example by increasing the number of employees that take preventive measures to ensure good health and work functioning.[15]

Work-related health and work functioning of hospital physicians

Hospital physicians (medical specialists and medical residents) are faced with occupational exposures and job demands that might threaten their work-related health and work functioning. For example, they experience emotionally demanding situations, such as violent behaviour by a patient[16] (or his/her family) or the death of a patient[17], are exposed to bodily fluids[18] and chemical substances[19] and/or need to adapt and maintain uncomfortable working postures when performing surgery.[20] As a result, hospital physicians might develop work-related health complaints. Both psychological complaints, like depressive- or stress symptoms, as well as physical complaints, such as pain in neck, lower back or arms, are present among hospital physicians.[21-24]

In addition to this reduced health status obviously affecting the well-being of hospital physicians, it might also affect their quality of work and patient safety when their health requirements do not meet the demands of a certain task. For example, hospital physicians with symptoms of fatigue, depressive symptoms or burnout are more likely to make mistakes.[25-27] As a consequence, their reduced health status also poses a health risk for others and might threaten patient safety.[28] Imagine a surgeon experiencing symptoms of work-related fatigue due to excessive working hours. He or she is likely to fail meeting the requirement of being alert and responsive to unexpected situations when performing surgery, which increases the risk of making errors, with all the corresponding consequences.[28] As well as affecting work performance, diminished health might also negatively affect other aspects of work like the quality of interaction with patients and the capacity for showing empathy.[27,29,30] In order to maintain and improve the quality of care, and to safeguard patient safety, taking care of the work-related health of hospital physicians is important.

When taking into account the fact that employers are legally required to make WHS available for all workers[31], an evidence-based job-specific WHS for hospital physicians can serve as an occupational health strategy to prevent reduction of quality of care and putting patient's safety at risk through the early detection of diminished health and recommendation of appropriate preventive actions. However, until now, the local evidence base of occupational demands and health effects of hospital physicians is lacking. Providing this evidence and developing a job-specific WHS for hospital physicians and medical residents is the first of two objectives of this thesis. International evidence on occupational demands and health effects in the work of hospital physicians obtained by performing a systematic literature review was used as an additional source in addressing the first objective[32] (see appendix attached to Chapter 4).

Difficulties among hospital physicians in addressing their own work-related health

Once an evidence-based job-specific WHS for hospital physicians has been developed, it should be implemented to investigate whether it will result in the intended outcomes. Does implementation of the WHS actually lead to maintaining good work-related health of hospital physicians? However, before implementing the WHS as an occupational health strategy to take care of the work-related health and work functioning of hospital physicians, it should be investigated whether the target group is actually willing to accept this method of receiving occupational healthcare.

For several reasons, the care needed to address the psychological and physical health complaints of hospital physicians does not seem to reach the target group, resulting in hospital physicians who continue to work while they are sick.[33] The present behavioural culture among hospital physicians seems to play a major role here in preventing them from accessing health care. Hospital physicians tend to neglect their own symptoms and/or to trivialize the potential negative effects of their illness and therefore delay or avoid seeking help.[34] In addition, they often experience difficulties entering the patient role and, due to issues of confidentiality, also have problems revealing any illness to other colleagues.[35,36] This might be especially prevalent in a competitive environment in which taking sick leave is considered a 'weakness', resulting in a significant barrier to seeking care.[37] As a result, hospital physicians turn to self-diagnosis and self-treatment for both acute and chronic diseases.[34] Although there is little consensus among hospital physicians regarding the acceptability of self-treatment of acute or chronic diseases, a culture of self-reliance has already been established.[35] It is only when health complaints (and the effects thereof) become inevitably visible to others that hospital physicians tend to turn to healthcare facilities. However, at that point the quality of care and patient safety may have already been jeopardized for a period of time.

Furthermore, hospital physicians might experience difficulties accessing good healthcare, for example because they do not have their own general practitioner or any other source of regular medical care, or because they question the quality of care delivered by colleagues.[38,39] In addition, finding a replacement when taking sick leave might be difficult, which mainly applies for physicians working in a partnership or in a private clinic.[40] As also holds true for hospital physicians who are employed, considering the long waiting lists combined with a great feeling of responsibility towards both colleagues and patients might prevent hospital physicians from taking sick leave.[33]

Hospital physicians have the tendency to continue working even when they feel sick. Four out of every five hospital physicians reported working while having an illness that they would have sick-listed a patient for during the last year.[34,40] Thus, before implementing the WHS to address the work-related health and work functioning of hospital physicians, taking into account these cultural attitudes towards taking care of their own health, investigating to what extent hospital physicians are actually prone to adopt the WHS as a measure to look after their own health is considered a necessary first step.

Specific consideration is given to cultural healthcare attitudes among hospital physicians by investigating whether medical students – the hospital physicians of the future– differ in their attitudes regarding healthcare needs and behaviour. The culture of self-prescription and self-treatment is thought to be acquired at medical school as the values, attitudes, behaviour and ethics are shaped by the attitudes and behaviour of teaching hospital physicians, who are looked at as role models.[41-43]

Because medical students also become increasingly concerned about confidentiality as their medical career progresses[41], it is important to investigate to what extent medical students have care needs and to what extent they are aware that a reduced health status might negatively affect their work functioning. Determining their attitudes and healthcare behaviour helps to shape the way the WHS should be implemented in order to increase the odds that the job-specific WHS contributes to having healthy hospital physicians and maintain high standards of care delivery in the future.

Implementation of a job-specific WHS

Two main frameworks of implementation strategies have been distinguished that can guide the implementation of an intervention – the rational framework and the participative framework.[44] When applying the rational framework to the implementation of the job-specific WHS for hospital physicians, medical directors or the general board of a hospital take the initiative and guide the implementation because they believe the intervention is desirable and benefits the organisation and the individual hospital physician. A potential risk of this approach is that the needs of the target group are neglected. This is not the case when following the participative framework approach, since here the implementation of an intervention is driven by the employees and occurs slowly, taking into account the knowledge and needs of the employees.[45] Combining these two approaches, Grol and Wensing[46] have proposed an implementation strategy that recommends that medical directors or the general board take the initiative for implementation. However, they recommend an analysis of the context in which the implementation is to take place to reduce the odds that the target group will reject or hinder the implementation, because implementation of an intervention is thought to be more effective when it aligns with the habits and routines of the target group.[47] In order to assess the contextual factors and overcome the (cultural) difficulties that might arise when implementing the intervention, performing a feasibility study is considered relevant and necessary to tailor the procedure of the WHS to the needs and habits of the target group. A feasibility study serves to determine whether an intervention, such as the job-specific WHS, is appropriate for further testing, especially when the population or intervention target might need unique consideration.[48]

The feasibility study should result in a WHS that is suited for testing its effectiveness in the real world. Most evidence-based recommendations for behavioural interventions are derived from controlled trials, which reduces the external relevance and generalizability.[49] In order to specifically test the fit of the WHS in the real-world setting, the primary focus should be on factors that either limit or support the implementation of

the intervention before testing its effectiveness.[50] These factors can relate to characteristics of the intervention, of the target group or of the organisation.[44] To that extent, the feasibility study consists of testing components of the intervention among a small number of individuals and may involve adapting the intervention and the materials used to the local population and to the environment.[51] The evaluation is primarily qualitative and focusses on determining whether the intervention was delivered as planned and whether it is accepted by the target group.[52] With these aims in mind, the second objective of this thesis is to evaluate whether the developed job-specific WHS for hospital physicians and medical residents is feasible and acceptable.

Aim, objective and research questions

The aim of this thesis is to develop and implement a job-specific WHS for hospital physicians, which lead to the following two objectives:

i. To provide evidence for a job-specific WHS for hospital physicians; and
ii. To evaluate whether the developed job-specific WHS for hospital physicians is feasible and acceptable.

To address these objectives, the following research questions were formulated:

1. What are the occupational demands and work-related health effects, and resulting work functioning effects, of hospital physicians?
2. What are the steps necessary to create the content of the job-specific WHS?
3. Is the new job-specific WHS feasible and acceptable?
4. What are the care needs of future hospital physicians?

Outline of this thesis

The first two chapters address the first research question of this thesis and provide an evidence base for a job-specific WHS for hospital physicians. A cross-sectional study describing the prevalence of common mental disorders among hospital physicians and investigating their association with self-reported work ability is reported first (Chapter 2). The next chapter describes the physical job demands and related health complaints of hospital physicians (Chapter 3).

The second research question is addressed in Chapter 4, where we describe both the steps that should be taken to arrive at a job-specific WHS as well as the content of the job-specific WHS for hospital physicians. In the following chapter (Chapter 5), the results of the feasibility study are reported, answering our third research question concerning whether the new job-specific WHS for hospital physicians is considered feasible and acceptable. To investigate future acceptability, Chapter 6 describes the current and future care needs of future hospital physicians and addresses the fourth research question.

The closing Chapter 7 reveals the main findings of this thesis, followed by a general discussion and recommendations for research and practice.

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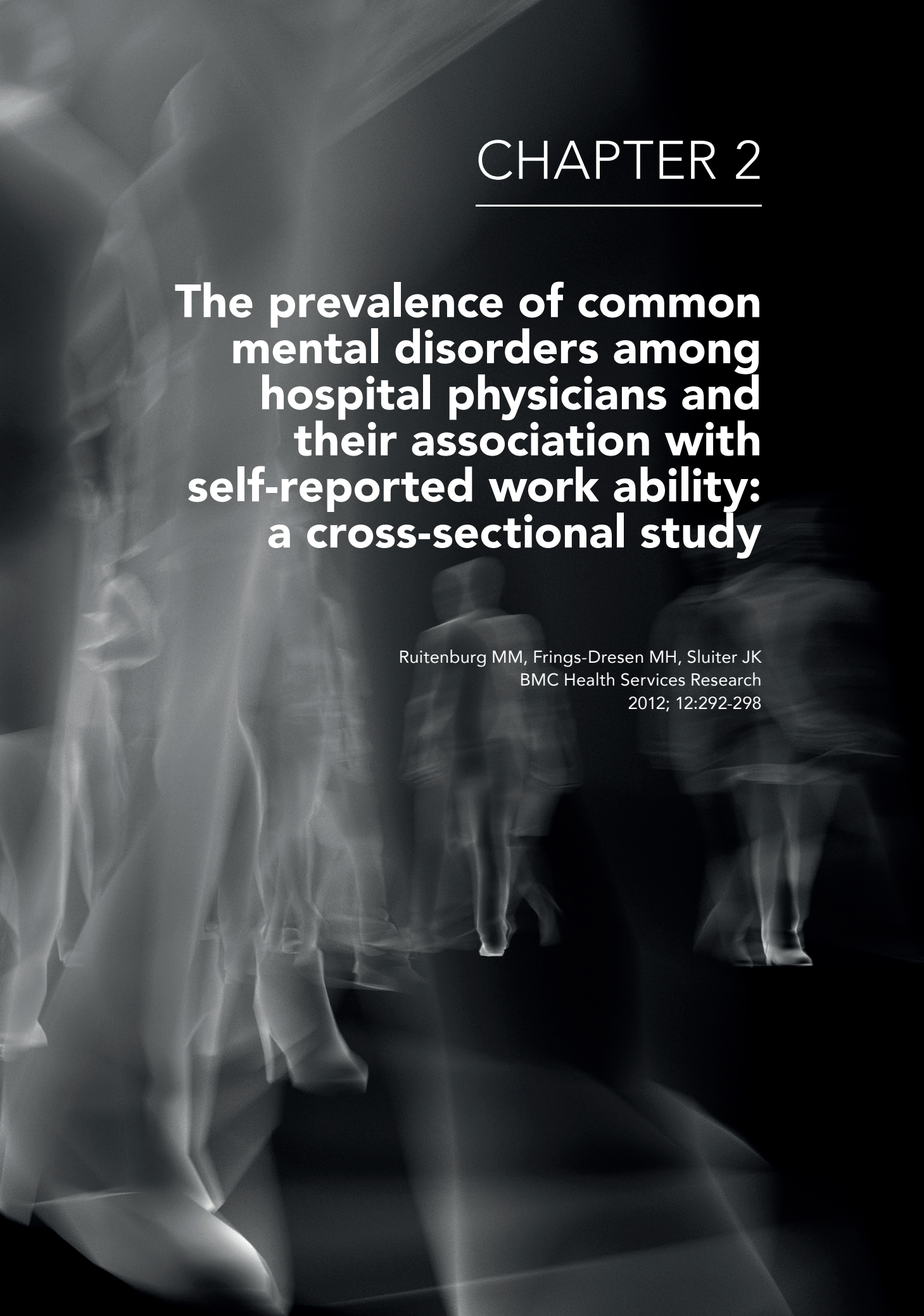

CHAPTER 2

The prevalence of common mental disorders among hospital physicians and their association with self-reported work ability: a cross-sectional study

Ruitenburg MM, Frings-Dresen MH, Sluiter JK
BMC Health Services Research
2012; 12:292-298

Abstract

Background

We studied the prevalence of common mental disorders among Dutch hospital physicians and investigated whether the presence of a mental disorder was associated with insufficient self-reported work ability.

Methods

A questionnaire was sent to all (n=958) hospital physicians of one academic medical center, using validated scales to assess burnout, work-related fatigue, stress, post-traumatic stress disorder (PTSD), anxiety and depression. Furthermore, respondents were asked to rate their current work ability against the work ability in their own best period (adapted version of the first WAI item). The prevalence of each common mental disorder was calculated. In addition, odds ratios of reporting insufficient work ability for subjects with high complaint scores compared to physicians with low complaint scores were calculated for each mental disorder.

Results

The response rate was 51%, and 423 questionnaires were eligible for analysis. The mental disorder prevalence rates were as follows: work-related fatigue 42%, depression 29%, anxiety 24%, posttraumatic stress complaints 15%, stress complaints 15% and burnout 6%. The mean score for self-reported work ability was 8.1 (range 0-10), and 4% of respondents rated their own work ability as insufficient. Physicians with high mental health complaints were 3.5- for fatigue, 5.6- for PTSD, 7.1- for anxiety, 9.5- for burnout, 10.8 for depression and 13.6-fold for stress more likely to report their work ability as insufficient.

Conclusions

The prevalence of common mental disorders among hospital physicians varied from 6% for burnout to 42% for work-related fatigue. Those physicians with high complaints had significantly 4- to 14 times increased odds of reporting their own work ability as insufficient. This work suggests that to ensure future workers health and patients safety occupational health services should plan appropriate intervention strategies.

Background

The number of vacant jobs for hospital physicians in the Netherlands reached its highest point ever near the end of 2009.[1] Due to the aging society, the number of patients and the number of chronic diseases will increase and, subsequently, so will the required care and number of hospital physicians. In addition, a great exodus of physicians will take place as many reach their retirement age.[2] To keep health care availability at the desired level, it is important to keep hospital physicians healthy in their job and to prevent ill health or even absenteeism.

Work-related fatigue has been associated with increased sick leave.[3] A more severe form of fatigue is burnout. As another aspect of physicians' psychological health, burnout increases the occurrence of sickness and absenteeism, and it is an example of a mental disorder that occurs in physicians, as reviewed in Sanderson and Andrews and De Valk and Werner.[4,5] Physicians' mental health is also important because it can affect their work performance and thereby patient safety.[6] For example, depressive symptoms among physicians have been reported to lead to medical mistakes and to adversely affect physicians' attitudes towards patients; residents with burnout have reported significantly more errors than those not suffering from burnout.[7-9] In addition, moderate and high psychological distress increases the odds for workplace failure and decreases the odds for workplace success.[10] Mental disorders not only affect work performance but also influence other aspects of work, such as the quality of interaction with patients and colleagues. Negative aspects of mental well-being, such as burnout, may be associated with a lower capacity for empathy and suboptimal patient care.[11-13] Prolonged fatigue has been found to be negatively associated with the relationship quality between physicians and staff.[14] Together, these findings indicate that the mental health of hospital physicians influences their job performance, which is reflected in both the risk of making mistakes and in the quality of interaction with patients and colleagues. Job performance can be examined using the concept of work ability, as measured by the Work Ability Index (WAI).[15] Work ability is a measure of the degree to which a worker is physically and mentally able to cope with the demands at work.[15] Decreased work ability is associated with reduced job performance and with an increased risk of long-term sickness absence.[16,17] It would be interesting to investigate the level of work ability in hospital physicians and the relationship with the presence of a common mental disorder.

Several studies conducted outside the Netherlands have indicated that physicians are at risk of developing common mental disorders and that these have an impact on their quality of work. These studies either investigated the relationship between general well-being and quality of work or focussed on an aspect of mental health, like depressive symptoms, and its association with quality of work.[7,11,12] In the Netherlands, some studies have examined hospital physicians and mental disorders, but these studies either only focused on burnout[9,18,19] or did not report any prevalence rates.[20] To our knowledge, no study has evaluated the prevalence among working hospital physicians of the most common mental disorders found in the general working population. Therefore, this study had two aims: to investigate the prevalence of six common mental

disorders among one population of Dutch hospital physicians (i.e., work-related fatigue, stress, depression, anxiety, burnout and posttraumatic stress disorder) and to investigate whether the presence of a mental disorder is associated with the way physicians perceive their own work ability.

Methods

Population and procedure

All 958 medical doctors working in one academic medical center in the Netherlands were eligible to participate in this study. This population included all specialists in 1 of the 23 subspecialties and all medical residents, doctors following a specialisation specialty after graduating from university, working in one academic medical center in the Netherlands. In autumn of 2009, the participants received an email with information about the study followed by an email with a link and a personal password to an online questionnaire. This questionnaire was part of a larger study to gather information to develop a job-specific workers' health surveillance programme for hospital physicians in all academic medical centers in the Netherlands. The participants were asked to fill out the questionnaire within two months after receiving the email. Participants gave their informed consent to participate by starting the online questionnaire. For performing this cross-sectional study no official medical ethical procedure is obliged in the Netherlands.

Study measures

The questionnaire contained items to gather general sample information concerning age, gender and seniority (physician or resident). Furthermore, data were gathered concerning work-related psychological health effects including burnout, posttraumatic stress disorder (PTSD), work-related fatigue, stress, depression and anxiety.

Burnout was measured using the Dutch version of the Maslach Burnout Inventory (MBI).[21] Burnout encompasses three domains: emotional exhaustion, depersonalisation and personal accomplishment. Following Maslach et al.[21], the domains of emotional exhaustion (eight items) and depersonalisation (five items) were used for this study. These thirteen items are scored on a seven-point frequency scale from 0-6. Each scale score is computed by summing the scores of the items, resulting in a range for emotional exhaustion of 0-48 and a range for depersonalisation of 0-30.
PTSD was measured using the Dutch version of the Impact of Event Scale.[22; Dutch version, 23] The translated version showed good reliability and construct validity.[24] The scale consists of fifteen items scored on a four-point frequency scale from 0-5. Participants are asked to rate how frequently during the last seven days they experienced certain thoughts and feelings related to a particular life event, for example the death of a patient (e.g., 'I had waves of strong feelings about it'). A scale score is computed by summing the scores on each item, resulting in a scale score ranging from 0 to 75.
Work-related fatigue was measured using the need for recovery after work scale from the Dutch Questionnaire on the Experience and Evaluation of Work.[25] This scale contains eleven statements using a yes/no format. An example is as follows: 'generally,

I need more than an hour before I feel completely recuperated after work'. The scale scores range from 0-100. Psychological distress complaints were measured using the distress screener, which is a shortened version of the four-dimensional symptom questionnaire (4DSQ).[26; original version, 27] This shortened version consists of three items scored on a three-point frequency scale from 0-2. The scores of the items are summed to obtain a scale score.
Both depression and anxiety were measured with their respective subscales of the Brief Symptom Inventory (BSI)[28], the abbreviated version of the Dutch version of the Symptom Checklist-90 (SCL-90).[29] These scales consist of six items that are scored on a five-point frequency scale from 0-4. The scores on the separate items are summed and divided by the total number of items, resulting in scale scores ranging from 0-4.

Work ability
Using an adapted, profession-specific version of the first question of the Work Ability Index (WAI)[15], physicians were asked to rate their own current work ability against their work ability as a physician in their own best period on an eleven-point scale from 0-10, with ten being the best work ability in their own best period of life. Subjects reporting a work ability score lower than six are considered to rate their own work ability as insufficient (in analogy with the school rating system in the Netherlands).

Analyses
The study population's mean scores and frequencies for the demographic data were calculated first. Mean scores were calculated for each common mental health disorder. In addition, based on established cut-offs for each complaint, two groups were composed of subjects with and without a common mental disorder. The prevalence for each mental disorder was calculated. A case of burnout was defined as an individual with high scores for both emotional exhaustion (score ≥27) and depersonalisation (score ≥10).[21] For PTSD, the cut-off score of 26 or higher was used because people are then suspected to suffer from PTSD.[30] For work-related fatigue, people with scores higher than 54.5 are considered to have high work-related fatigue.[31] With a scale score ≥4 on the distress screener, a subject is considered to have high stress complaints.[26] For both depression and anxiety, subjects with a score ≥0.41 are considered to have high complaints.[28] Mean scores were calculated for the self-reported work ability and the percentage of participants rating their own work ability as either sufficient or insufficient.

To investigate the relationship between the occurrence of health complaints and self-reported work ability, the odds ratio of reporting insufficient work ability for subjects with high complaints was estimated for each psychological health complaint and compared to those with low complaints. This was done by performing a binary logistic regression analysis. Analyses were performed using SPSS 17.0 for Windows.

Results

There was a total of 458 survey respondents (51%); 29 questionnaires were not analysed because these respondents had no clinical duties and had primarily managerial duties. Six questionnaires were lost due to incomplete responses. A final number of 423 questionnaires were used for the analysis.

Demographic variables

Table 1 shows selected characteristics of our study population. A little more than half of the respondents were working as medical doctors (54%). A slight majority of respondents were female (53%), mainly due to a greater number of female respondents among the medical residents (58%). The age of the total population averaged 41 years (SD= 10.1); the medical doctors (mean age = 47 years, SD= 8.9) were significantly older ($t= 21.73$, $p<.05$) than the medical residents (mean age = 33 years, SD= 3.2).

TABLE 1 Overview of the demographic characteristics of the study population

	Total		**Medical doctor (54%)**		**Medical resident (46%)**	
	%	*(n)*	*%*	*(n)*	*%*	*(n)*
Male	47	(199)	52	(119)	42	(80)
Female	53	(223)	48	(110)	58	(113)
	Mean	*(SD)*	*Mean*	*(SD)*	*Mean*	*(SD)*
Age (years)	41	(10.1)	47	(8.9)	33	(3.2)

Prevalence of common mental health disorders

An overview of the mean scores and prevalence rates of the examined common mental health disorders for subgroups of gender, profession and age is presented in Table 2. Two out every five physicians (42%) reported high work-related fatigue. One quarter of physicians were found to have high depression (29%) and anxiety (24%) complaints, and one out of every six (15%) physicians had high PTSD and stress complaints. The prevalence of burnout was 6%.

TABLE 2 Mean score values and the percentage (%) of participants scoring high on each health complaint

	Total	Gender		Profession		Age (years)			
		male	female	Medical doctor	Medical resident	20-35	36-45	46-55	> 56
Burnout	(n=395)	(n=187)	(n=207)	(n=214)	(n=181)	(n=168)	(n=115)	(n=63)	(n=49)
Emotional exhaustion (Mean; 0-48)	14.1	12.5	15.5	13.3	15.0	14.8	13.6	13.9	12.8
SD	8.0	7.2	8.5	8.0	8.0	14.8	13.6	8.8	7.3
Depersonalisation (Mean; 0-30)	5.4	5.4	5.3	4.5	6.4	6.0	5.5	4.8	3.6
SD	4.4	4.4	4.4	4.1	4.5	4.2	4.9	4.6	3.3
Burnout indicative	6%	3%	9%	6%	7%	7%	5%	10%	2%
PTSD	(n=380)	(n=178)	(n=201)	(n=206)	(n=174)	(n=164)	(n=109)	(n=60)	(n=47)
Mean (0-75)	10.6	8.3	12.8	11.0	10.1	10.4	10.6	11.6	10.5
SD	13.1	11.6	14.0	13.4	12.8	12.5	13.3	14.7	12.8
PTSD indicative (≥ 26)	15%	9%	20%	16%	14%	13%	17%	15%	15%
Work-related fatigue	(n=389)	(n=182)	(n=206)	(n=211)	(n=178)	(n=166)	(n=112)	(n=63)	(n=48)
Mean (0-100)	44.3	39.2	49.0	41.1	48.0	47.6	38.6	44.4	45.8
SD	29.2	29.0	28.6	28.3	29.8	29.2	29.1	28.3	29.2
high (>54.5)	42%	36%	49%	37%	48%	48%	35%	40%	44%
Stress complaints	(n=398)	(n=186)	(n=211)	(n=216)	(n=182)	(n=169)	(n=116)	(n=63)	(n=50)
Mean (0-6)	1.9	1.6	2.2	1.7	2.1	2.1	1.7	1.8	1.6
SD	1.7	1.5	1.8	1.6	1.8	1.8	1.5	1.9	1.5
Depression	(n=400)	(n=189)	(n=210)	(n=216)	(n=184)	(n=170)	(n=116)	(n=64)	(n=50)
Mean (0-4)	0.35	0.29	0.41	0.32	0.39	0.36	0.35	0.37	0.32
SD	0.5	0.4	0.6	0.5	0.6	0.6	0.5	0.5	0.5
Depression indicative (>0.41)	29%	25%	32%	27%	31%	29%	27%	30%	34%
Anxiety	(n=390)	(n=187)	(n=202)	(n=211)	(n=179)	(n=165)	(n=114)	(n=63)	(n=48)
Mean (0-4)	0.33	0.25	0.40	0.27	0.39	0.39	0.27	0.35	0.22
SD	0.5	0.4	0.6	0.4	0.6	0.5	0.4	0.6	0.3
Anxiety indicative (>0.41)	24%	18%	29%	19%	30%	30%	17%	24%	19%

Within the subgroups of gender, profession and age, some variation was observed in the prevalence rates of high scores for mental health disorders (table 2). For example, the prevalence rate of female physicians with a (posttraumatic) stress-indicative score (20%) was twice as high as male physicians (9%).

Work ability and the relationship with each psychological health complaint

As shown in Table 3, hospital physicians had a mean work ability score of 8.1, and 4% of physicians rated their work ability as insufficient.

TABLE 3 Ratings of self-reported work ability and number of subjects with insufficient or sufficient work ability

	Total	Gender		Profession		Age (years)			
		male	female	Medical doctor	Medical resident	20-35	36-45	46-55	> 56
Work ability	(n=405)	(n=191)	(n=213)	(n=219)	(n=186)	(n=171)	(n=119)	(n=65)	(n=50)
Mean	8.1	8.4	7.8	8.2	7.9	7.9	8.3	8.3	7.8
SD	1.5	1.4	1.5	1.5	1.4	1.6	1.2	1.2	1.8
	%	%	%	%	%	%	%	%	%
Insufficient (score < 6)	4	2	5	3	4	5	3	2	4
Sufficient (score ≥ 6)	96	98	95	97	96	95	97	98	96

Table 4 shows the results from the analyses in which each psychological health complaint was examined in relation to insufficient work ability. These analyses showed that physicians with scores indicative of mental health disorders were 3.5- for fatigue, 5.6- for PTSD, 7.1- for anxiety, 9.5- for burnout, 10.8- for depression and 13.6-fold for stress more likely to report their work ability as insufficient than those without scores indicative of mental health disorders.

TABLE 4 Overview of the odds ratios (ORs) for insufficient work ability by high psychological health complaints

		(n)	OR	95 % CI	Sig.
Burnout	low	(371)			
	high	(24)	9.5	3.0 - 30.6	.000
PTSD	low	(324)			
	high (≥ 26)	(56)	5.6	2.0 – 16.3	.001
Work-related fatigue	low	(224)			
	high (>54.5)	(165)	3.5	1.1 – 11.5	.035
Stress complaints	low	(339)			
	high (≥ 4)	(59)	13.6	4.5 – 41.6	.000
Depression	low	(284)			
	high (> 0.41)	(116	10.8	3.0 – 39.1	.000
Anxiety	low	(298)			
	high (> 0.41)	(92)	7.1	2.4 – 21.5	.000

Discussion

To our knowledge, this is the first study to investigate the prevalence of several relevant common mental disorders among one group of hospital physicians and the association of these disorders with self-reported work ability. We found prevalence rates of 42% for work-related fatigue, 29% for depression, 24% for anxiety, 15% for PTSD and stress and 6% for burnout. Physicians rated their own current work ability with a mean score of 8.1 (range 0-10), and 4% of physicians rated their current work ability as insufficient, indicating that they were having difficulties coping with the demands of their work. Physicians with high mental health disorder scores were 3.5- to 13.6-fold more likely to report their work ability as insufficient compared to colleagues without those complaints.

The relatively high prevalence rates of the common mental disorders might theoretically be affected by the potential correlation between the investigated psychological variables. Post-hoc analysis revealed that the explained variance between the raw scores of any two psychological complaints scales did not exceed 50% in our study. We only used validated scales with established cut-off points to assess the prevalence rates of the investigated common mental disorders. In addition, missing data about the mental health status of the non-responding physicians might lead one to argue that the prevalence rates of common mental disorders in the total population might differ from the ones found in this study. When performing a theoretical exercise, one might reason that the prevalence estimates for each of the mental health complaints would decrease to half of the reported prevalence rates when the other 49% of the hospital physicians would not report any complaints. On the other hand, when one reasons that all of the other 49% of hospital physicians would at least report one mental health complaint, the prevalence rates would increase dramatically. Variation on several factors in this population seems to make it impossible to predict in which direction this bias would go. However, although this might affect the reported prevalence, it seems unlikely that the relationship between the presence of a mental health complaint and self-reported work ability would be significantly affected.

No other studies were found investigating the prevalence rates of work-related fatigue and stress among hospital physicians, indicating that knowledge on this subject is both relevant and needed. In comparison with other studies reporting prevalence rates for burnout of 13% and 21% among residents in the Netherlands[18,19], this study found a relatively low prevalence of burnout (6%). However, these studies also reported that 4-6% of the medical residents had severe burnout, which seems more in line with our definition. Studies conducted outside the Netherlands reported that 22-24% of hospital physicians were labelled as cases of burnout.[32,33] These differences might be associated with differences in work demands [e.g., working hours]. Compared to prevalence rates for depression found in other studies, which varied between 8% and 29%[34-37], we found a relatively high percentage of physicians (29%) with depressive symptoms indicative of a depressive disorder. The percentage of physicians reporting PTSD (15%) was similar to that found in one other study[38], but it was larger than the 4% found in a study among Canadian physicians.[39] The prevalence rate for anxiety complaints (24%) was similar to

the prevalence rates of anxiety disorders of 17% in men and 26% in women found in another recent study.[36]

In this cross-sectional study it was found that hospital physicians with psychological ill health were significantly more likely to report insufficient work ability compared to hospital physicians with good mental health. The number of hospital physicians (4%) reporting insufficient work ability is considered relatively high. Hospital physicians rating their own work ability as insufficient might be at risk for future sickness absence because reduced self-reported work ability has been strongly associated with an increased risk of long-term sickness absence.[17] Reduced work ability has also been associated with reduced job performance.[16] Therefore, reduced work ability and ill mental health may result in hospital physicians putting patient safety at risk. This idea is supported by several studies showing that mental health complaints, such as burnout and depression, increase the risk for medical mistakes and workplace failure.[7,10,40]

In the Netherlands, several attempts have been made to improve and ensure patient safety, varying from introducing changes at the organisational level of hospitals to improving clinical technologies. For example, a new surgical safety checklist has been developed to reduce the number of surgical complications.[41] From the perspective of occupational health, our findings indicate that more attention should be given to the mental health of hospital physicians to ensure patient safety. Using a job-specific workers' health surveillance programme, the mental health conditions of physicians can be monitored to identify physicians showing early signs of developing a common mental disorder and to intervene accordingly to decrease these complaints. In addition to focusing on health effects, the exposure to certain job characteristics of hospital physicians should also be considered. Current literature indicates that the work of hospital physicians puts them at risk of developing common mental disorders. In general, job strain and high psychological demands, particularly prevalent in the work of hospital physicians, can predict common mental disorders.[14,42] Physicians may be vulnerable to developing depressive symptoms because of their everyday exposure to patient suffering, disease, death, emergency and unreasonable patient demands.[33,43,44] The long working hours, especially prevalent during residency, put hospital physicians at risk of becoming fatigued.[45] Because physicians are often reluctant to seek help, perhaps because they believe they can help themselves, they are more vulnerable than the general population .[43,44] Thus, it seems reasonable to assume that changes in work conditions can improve physicians' mental health and subsequently ensure patient safety. However, because some specific job demands in the work of physicians cannot be changed, it seems more beneficial to focus on monitoring the mental health of physicians to capture those at increased risk of decreased work functioning or future sick leave absence. One way to monitor the mental health of physicians is to investigate whether they have high mental health complaints. Based on the strong association found in this study between physicians' ill mental health and reduced work ability, it may be possible to monitor the mental health of physicians by repeatedly surveying their own current work ability. Reduced self-reported work ability might be a signal of underlying ill mental health, which has been associated with an increased risk of long-term sick leave absence. To maintain physician health on the job, a workers' health

surveillance programme should be established as an occupational health strategy; interventions for high-risk groups of physicians should be used to restore a physician's reduced work ability and to evaluate the effects of this strategy.

Conclusions

The prevalence of common mental disorders among hospital physicians varied from 6% for burnout to 42% for work-related fatigue. The mean score for self-reported work ability was 8 (range 0-10) and 4% rated their own work ability as insufficient. Those hospital physicians with high complaints had significantly increased odds (between 4 and 14 fold) of reporting their own workability as insufficient. A reduced work ability increases the risk of long term sickness absence and is associated with reduced job performance.[16,17] In order to ensure patients' safety and to keep physicians healthy at the job, more attention should be given to the mental health of hospital physicians. Monitoring the mental health status of hospital physicians by self-rating of their own current work ability contributes to capturing those physicians at increased risk of decreased work functioning or future sick leave absence.

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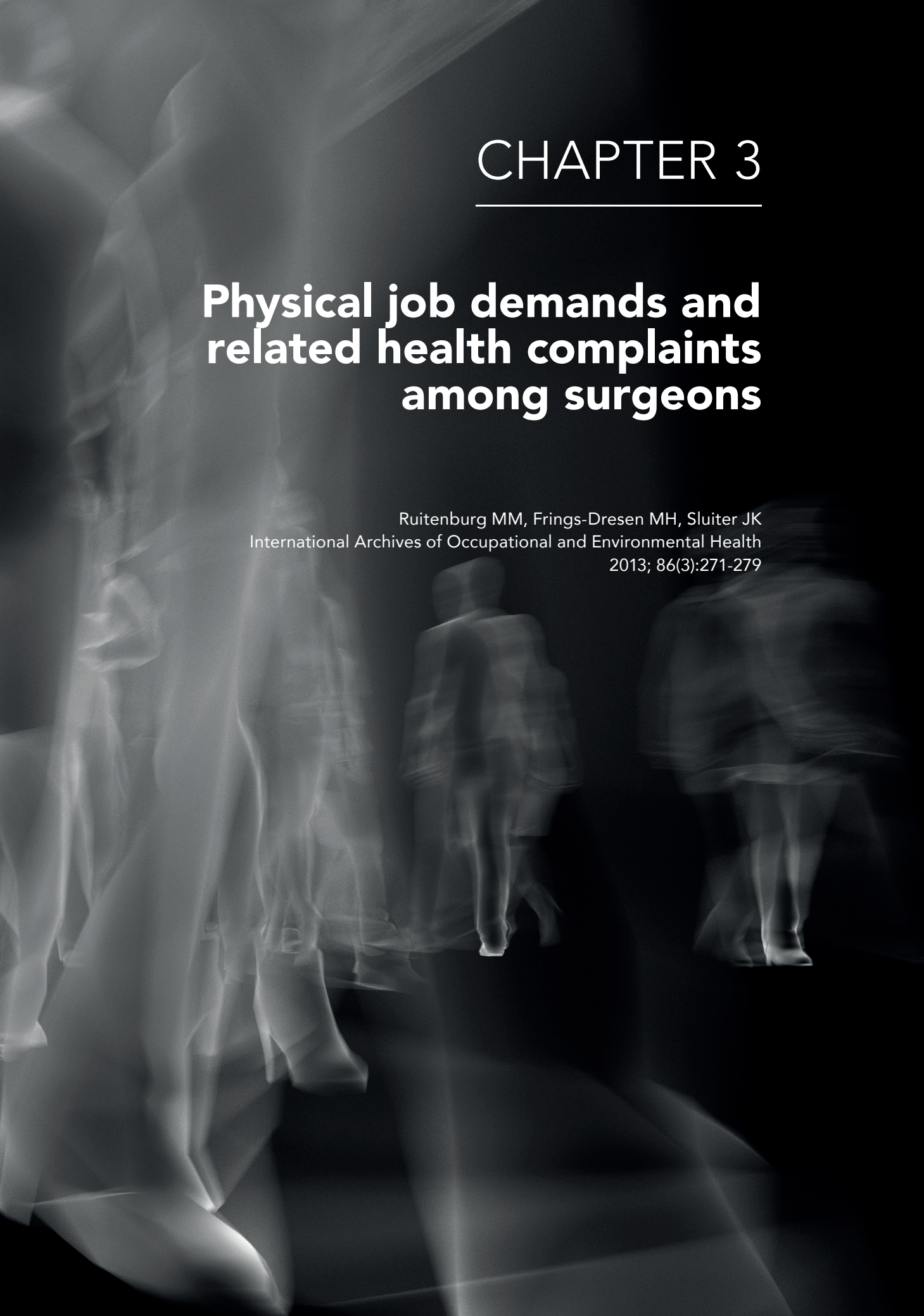

CHAPTER 3

Physical job demands and related health complaints among surgeons

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Abstract

Purpose

Surgeons' poor physical health and high physical job demands might threaten good quality of care. We aimed to compare the prevalence of physical complaints of surgeons, their physical work ability and the physical job demands of surgeons with that of other hospital physicians.

Methods

All medical doctors (n=958) of one academic medical center were invited to complete the online questionnaire to assess the physical work ability and the prevalence of regional musculoskeletal complaints. A purposive sample of 44 surgeons and 82 other hospital physicians were systematically observed during work to quantify the physical job demands for an average working day.

Results

More surgeons found their work to be physically strenuous (41 vs. 13%, p<.000) and more were bothered by working in uncomfortable or exhausting postures (73 vs. 27%, p<.001). Both groups reported that most of their physical complaints were in the neck (39 and 32%) and arm regions (36 and 27%). The majority of surgeons (86%) and other hospital physicians (79%) experienced difficulties coping with their job demands because of their physical state once a month or less. Compared with other hospital physicians, surgeons stand longer (4 vs. 3h, p=.004) and perform fine repetitive movements longer (80 vs. 3 min, p<.001) during an average working day.

Conclusions

Exposure to several physical job demands that are perceived as uncomfortable and exhausting and the presence of physical health complaints reduce surgeons' work functioning.

Introduction

Due to an aging society and a declining younger workforce, surgeons will have to work until old age. For surgeons to remain healthy on the job, it is important to provide an optimal work environment that minimizes the risk of developing physical health complaints. A relevant first step would be to gain insight into the effects of the physical demands of work on surgeons, because high physical work demands increase the risk of ill health.[1] To our knowledge, no attempts have been made to quantify the physical work demands that surgeons experience during an average workday, although several studies have explored the physical demands of specific general and laparoscopic procedures.[2-4] These studies have indicated that performing specific types of surgery can put intense physical strain on surgeons. Surgeons have fixed work postures, tend to work with the arms abducted from the trunk and unsupported, with the cervical spine flexed forward and rotated.[2] A high static load is imposed on the both shoulder-neck region and the shoulder joint by this posture.[5] Furthermore, surgery can require long-term, fixed low-back postures while performing very precise movements, resulting in awkward positioning of the arms, hands and fingers, which can be categorized as mild-to-moderate physical demands.[3] Although performing surgery obviously constitutes a significant part of the surgeon's job, a surgeon's average workday consists of performing other tasks as well, including ward rounds, surgical meetings, patient consultations and report-writing.[6] To be able to take preventive measures that keep surgeons healthy on the job, knowledge of the physical job demands that surgeons experience during an average working day is relevant.

The presence of high physical job demands is a potential threat to surgeons' health, because it may put them at risk of developing work-related musculoskeletal complaints.[7] In general, risk factors for musculoskeletal complaints include awkward body postures, frequent repetitive movements and prolonged static head and back postures.[8] Surgeons have frequently reported complaints in the upper extremities, such as pain and stiffness in the neck, shoulders, back and lower back and thumbs.[6,8-10] A broad range of prevalence rates of physical complaints among different body regions has been found, which may be explained by the different case definitions and time frames used to define the presence of a physical complaint. For example, some studies have asked respondents to report symptoms of any pain, while others have asked them to report feelings of numbness or stiffness. In addition, studies have differed in reporting point-of-time, annual or life-time prevalence of physical complaints. Aside from the short-term negative effects on well-being at work, the presence of musculoskeletal complaints is a known risk factor for long-term sickness absence.[11,12] Furthermore, physical complaints may affect surgeons in functioning at work.[13]

To be able to prevent the health and work function-related problems experienced by surgeons, more knowledge of these conditions is needed. Therefore, the first aim of this study was to quantify the physical job demands of surgeons and to compare them with the other hospital physicians who served as a reference group. The second aim of this study was to compare the prevalence of physical complaints and physical work ability of surgeons with that of other hospital physicians.

Methods

Two methods, systematic observations and questionnaires, were used and reported separately. Data were gathered among surgeons and hospital physicians working in one academic medical center in The Netherlands. Ethical clearance was provided by the Medical Ethics Board of the Academic Medical Center for this study.

Systematic observations at the workplace

To quantify the physical job demands of surgeons and other hospital physicians during an average workday in terms of duration, frequency and intensity, systematic observations using a hierarchical task analysis were conducted at the workplace.

Population

A purposive sample of medical doctors who specialized in one of three general medical specialties after university graduation, including observational (e.g., Internal Medicine), supportive (e.g., Clinical Genetics) and surgical (e.g., General Surgery) were eligible for this part of the study. The number of participating medical doctors depended on the number of observations following from the measurement strategy (see below).

Measurement strategy

The measurement strategy of the hierarchical task analysis was based on explorative interviews with one medical doctor of each of the 23 specialties, resulting in general information about the activities and body postures that could occur during a workday. The Task Recording and Analysis on Computer (TRAC) observation system[14] was used, which provides real-time data on the duration and frequency of activities and body postures of interest during work **(Appendix 1)**.

A measurement strategy was developed to capture all apparent facets of the job for each day of a week, taking into account the variation in duration and frequency of tasks, activities and body postures. The main causes of variation were the type of patients and the medical doctors' internship types, which are reflected, for example, in the activities engaged in during a workday. The measurement strategy resulted in 2-h observation periods that were divided over four predefined periods during a day shift: two periods in the morning and two in the afternoon. Based on the available working schedule, the observer asked medical doctors whether he was allowed to observe them for 2 h during work at a specific time period of the working day. Due to practical considerations, observation periods in the operating room lasted 4 h and were taken as two separate measurements. Observations were planned of a total of 44 General Surgery doctors, who represented the surgical specialties; 42 Internal Medicine doctors, who represented the observational specialties; and 40 medical doctors in several support specialties.

Observational procedure

Preceding the observations, the observers practiced the observation system until a high intra- and inter-observer intraclass correlation coefficient was obtained (ICC > 0.80).

To prevent inter-individual variation from being a potential confounder, medical doctors were randomly chosen based on their work schedule. After informing the staff and medical doctors that observations at the workplace would take place and permission was granted, the researcher contacted the medical doctors individually, after checking the work schedule, by sending them an e-mail request to participate in the study. Before the observation started, the researcher explained in detail how the observation would take place and explained that he would step back whenever the medical doctor or patient requested that he do so.

Questionnaire study

An online questionnaire was used to assess the prevalence of musculoskeletal disorders among surgeons and hospital physicians to identify their self-rated work-relatedness of complaints and to identify whether their musculoskeletal disorders limited their work functioning. The frequency of discomfort that was experienced during work because of specific physical activities was also assessed.

Population and procedure

A total of 958 medical residents and doctors received the online questionnaire. This population included all specialists and all medical doctors in any of the 23 subspecialties. In autumn of 2009, the participants received an e-mail with information about the study followed by an e-mail with a link and a personal password that allowed them to access the online questionnaire. The response rate was 52%.

Study measures

The questionnaire contained items designed to gather general sample information about age, gender and seniority (physician or resident). Data were also gathered concerning the prevalence of musculoskeletal disorders. The definition used for musculoskeletal disorders was regularly experienced recurrent and/or prolonged complaints in a certain body region during the past 6 months. Body regions were defined by a chart (Figure 1). Respondents were asked to report physical complaints on both sides of their bodies. In case of a physical complaint, they were asked whether they believed that their work was (partially) responsible for developing these complaints and whether they felt impaired in executing their work because of these complaints. All questions were

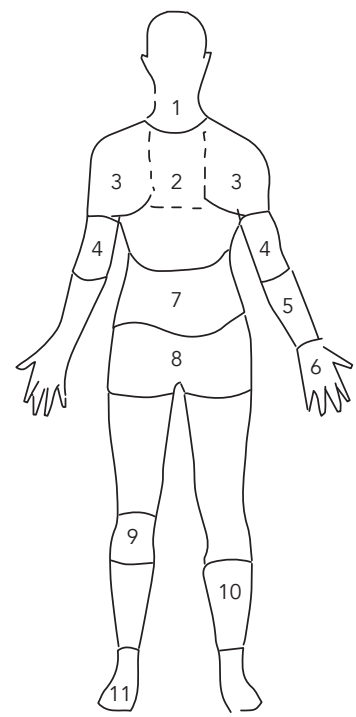

FIGURE 1 Defined body regions for reporting physical complaints (1 = neck, 2 = upper back, 3 = shoulder, 4 = elbow, 5 = forearm, 6 = wrist, 7 = lower back, 8 = hip, 9 = knee, 10 = leg, 11 = ankle)

answered on a dichotomous scale (yes/no). The body regions of interest were neck, shoulder, upper back, elbow, forearm, wrist, lower back, hip, knee, leg and ankle.

Furthermore, a modified version of the physical demands scale of the Dutch VBBA[15] was used to identify whether respondents had been seriously bothered in the past few weeks by any of several physical job demands. Responses were given on a dichotomous scale (yes/no). Concerning their physical work ability, respondents were asked to report how often during the past three months they had experienced difficulties in coping with their job demands because of their physical state by using a five category scale (never, once a month, several times a month, once a week, several times a week).

Analyses

For our first aim, the real-time data of the observations of Internal Medicine doctors and the support specialties were taken together and were considered as data representing 'other hospital physicians'. The duration and frequency of activities and body postures from each measurement were extrapolated to an average workday of 10 h. Mean (and SD) durations and frequencies were calculated at the group level for surgeons and other hospital physicians. When primary exploration of the data revealed an average absolute duration of more than 5 min for activities and an average frequency of body postures of more than five for an average workday, they were included in the analyses. After the data were checked for normality, an appropriate analysis, depending on the type of measurement parameter, was performed to test for significant differences in means and frequencies of activities and body postures between both groups. A frequency count and a Chi-square test were performed on data regarding the subjective experience of some of the physical demands. When there were too few observations to perform a Chi-square test, the Fisher's exact test was performed instead.

With respect to the second aim of this study, we first calculated the demographics of each group. To assess the prevalence of a musculoskeletal problem, the percentage of subjects who reported a regional complaint was calculated for each region. Within the group of respondents who reported physical complaints, the proportion who thought that work was partly responsible for developing these complaints and/or that the complaints impaired their work functioning was calculated. To test differences in the prevalence of complaints between surgeons and other hospital physicians, four body regions were formed: the neck region (neck and upper back), the lower back region, the arm region (shoulder, elbow, forearm and wrist) and the leg region (hip, knee, leg and ankle). The original response categories for physical work ability were recoded into two categories (once a month or less and several times a month or more). A frequency count and a Chi-square test were performed to test for differences. All analyses were performed using SPSS 17.0 for Windows.

Results

All 126 of the planned observations were executed. Based on the conclusion from the explorative interviews that the tasks and activities of medical residents during a working day were the most representative of tasks and activities for a general working day, observations were performed with medical residents. From the 458 questionnaires (response rate 52%) that were returned, a total of 395 questionnaires could be used for analysis. Some questionnaires were filled out incompletely, while a few others were filled out by medical doctors that performed non-clinical functions and were therefore considered not to be representative. Most surgeons (55%) were males, while most of the other hospital physicians (55%) were females (Table 1).

TABLE 1 Overview of the demographic characteristics of the questionnaire study population

	Surgeons (n=100)		**Hospital physicians (n=295)**		**Total (n=395)**	
	%	*(n)*	*%*	*(n)*	*%*	*(n)*
Male	55	(55)	45	(131)	47	(186)
Female	45	(45)	55	(163)	53	(208)
Medical doctor	59	(59)	51	(151)	53	(210)
Medical resident	41	(41)	49	(144)	47	(185)
	Mean	*(SD)*	*Mean*	*(SD)*	*Mean*	*(SD)*
Age (years)	41	(10.8)	40	(9.8)	41	(10.0)

Physical exposure

Table 2 gives an overview of the mean duration and frequency of activities and body postures. During an average working day, surgeons spent an equal amount of time sitting and standing (approximately 4 h each), whereas other hospital physicians spent more time sitting than standing (6 vs. 3 h, respectively). Surgeons make fine repetitive movements for a significantly longer time (80 min) compared with other hospital physicians (3 min), while the latter group works significantly longer on a computer (104 min) compared with surgeons (73 min). Both groups of physicians frequently perform cervical flexions or rotations, while the mean frequency of the other body postures is relatively low.

TABLE 2 Duration and frequency of activities and body postures, and a comparison between surgeons and other hospital physicians.

	Surgeons (n=44)		Hospital physicians (n=82)			
	Mean	*95% CI*	*Mean*	*95% CI*	*U*[a]	*p*
Duration activities (min)						
Sitting*	279	230-328	351	315-386	1,342	.018
Standing*	267	217-318	187	154-219	1,248	.004
Fine repetitive movements*	80	38-123	3	0-7	1,209	<.001
Working on a computer*	73	48-98	104	85-123	1,349	.019
Walking	2	1-3	1	0-1	1,447	.003
Duration body postures (min)						
Cervical flexion (> 25°)	119	82-157	71	61-82	1,505	.125
Cervical rotation (> 25°)*	27	23-32	49	39-59	1,396	.036
Lumbar flexion (> 60°)	10	7-13	12	9-14	1,741	.740
Asymmetric posture	4	1-7	1	0-2	1,625	.131
Lumbar rotation (> 20°)*	2	1-3	1	0-1	1,447	.003
One arm above shoulder	1	0-2	1	1-2	1,789	.902
Reaching*	1	1-2	5	3-7	1,284	.002
	Mean	*Min-max*	*Mean*	*Min-max*	*U*	*p*
Frequency body postures						
Cervical flexion (> 25°)	334	85-705	315	10-965	1,616	.336
Cervical rotation (> 25°)	289	70-610	410	5-1405	1,518	.143
Lumbar flexion (> 60°)	36	0-105	52	0-255	1,551	.194
Reaching*	25	19-31	67	47-88	1,127	.001
Lumbar rotation (> 20°)*	14	0-55	9	5-13	1,189	.001
Asymmetric posture*	13	0-135	5	0-50	1,444	.034
One arm above shoulder	9	0-60	13	0-110	1,710	.605

[a] The non-parametric Mann-Whitney U-test was performed on the data to investigate differences between groups
* Difference is significant ($p < .05$)

In addition to the quantified job demands, Table 3 shows the percentage of respondents that felt seriously bothered by specific physical activities. A larger proportion of surgeons than hospital physicians found their work physically strenuous (41 vs. 14%, respectively). In addition, a larger proportion of surgeons felt seriously bothered by making prolonged repetitive movements (35 vs.18%, respectively), working in uncomfortable or exhausting postures (73 vs. 27%, respectively) and using hand tools (8 vs 3%, respectively).

TABLE 3 Proportion (%) of respondents who were seriously bothered by certain physical job demands, and a comparison between both groups.

Physical demands	Surgeons *(n= 90-91)*		Hospital physicians *(n=279-280)*		χ^2	p
	%	*(n)*	%	*(n)*		
In your work, are you seriously bothered by….?						
…having to lift or move loads	10	(9)	9	(25)	.076	.782
…frequently have to bend down	9	(8)	9	(25)	.002	.968
…regularly having to reach up too high for objects	0	(0)	3	(9)	3.009	.083
…having to do the same movements continuously for a long period of time*	35	(32)	18	(51)	11.362	.001
…using hand tools*	8	(7)	3	(7)	5.175	.023
Do you have to work in uncomfortable or tiring positions?*	73	(66)	27	(75)	60.989	<.001
Do you find your work physically strenuous?*	41	(37)	13	(35)	34.819	<.000

* Difference is significant (p <.05)

Musculoskeletal complaints

Few surgeons and few hospital physicians reported complaints in the hip, knee, leg and ankle/foot region (see "Appendix 2").The most often reported physical complaints were located in the neck, upper and lower back and shoulder region. Except for reported physical complaints in the hip region, at least half of the surgeons who reported physical complaints framed these complaints as work-related. Furthermore, at least one of every three surgeons who reported physical complaints in the shoulder, forearm, wrist/hand and knee region indicated that these complaints impaired their work functioning. Most hospital physicians feel impaired in their work functioning by physical complaints in the forearm (43%), leg (43%) and elbow (42%) regions.

Although one out of every three hospital physicians (37%) reported having experienced physical complaints in the neck region, significantly more surgeons (50%) reported complaints in this region (Table 4). Compared with hospital physicians, significantly more surgeons (56 vs 14%, respectively) indicated that their work contributed to physical complaints in the leg region. Although not statistically significant, it appears to be a trend that more surgeons compared to other hospital physicians reported their work as being a contributing factor in the development of physical complaints in the neck and lower back region. The number of surgeons and other hospital physicians who felt impaired in their work functioning due to physical complaints in the different body regions ranges from 12 to 42%, but no significant differences were found between the two groups.

TABLE 4 Overview of the percentage (%) of respondents with physical complaints in each summed body region.

Physical complaints	**Surgeons** *(n=91)*		**Hospital physicians** *(n=281)*		χ^2	p
	%	(n)	%	(n)		
Neck	39	(35)	32	(89)	1.426	.232
work-related	80		69		1.629	.202
work-impairing	17		15		.125	.724
Lower back	24	(22)	25	(69)	.005	.942
work-related	59		38		3.122	.077
work-impairing	18		16		.061	.805
Arm	36	(33)	27	(76)	2.819	.093
work-related	61		63		.064	.801
work-impairing	42		26		2.782	.095
Leg	10	(9)	18	(51)	3.466	.063
work-related*	56		14		8.366	.004
work-impairing	22		12		.724	.395

* Difference is significant ($p < .05$)

Table 5 shows that the majority of surgeons (86%) and other hospital physicians (79%) rarely experienced difficulties coping with the physical demands of their jobs because of their physical state. However, one out of every seven surgeons (14%) and one out of every five other hospital physicians (21%) experienced difficulties at work because of impairments in their physical well-being.

TABLE 5 How often in the past three months did you experience difficulties coping with the job demands because of your physical state?

	Surgeons *(n=93)*		**Hospital physicians** *(n=284)*	
	%	*(n)*	*%*	*(n)*
Once a month or less	86	(80)	79	(223)
Several times a month or more	14	(13)	21	(61)
$\chi^2(1)=2.498$ $p>.05$				

Discussion

The physical job demands of surgeons were quantified for an average workday and compared with other hospital physicians. In comparison with other hospital physicians, surgeons perform fine repetitive movements 26 times longer and stand 130% longer. In addition, more surgeons (41%) find their work to be physically strenuous, are seriously bothered by making prolonged repetitive movements (35%) and by working in uncomfortable and exhausting postures (73%). A post hoc analysis revealed that the different gender distributions among surgeons and other hospital physicians did not influence these findings. These results bolster previous findings that surgeons contend with physical demands that are perceived as uncomfortable and exhausting.[2] The presence of high physical demands has been considered to be a risk factor for developing physical health complaints.[7] Whereas both surgeons and other hospital physicians experienced physical complaints mainly in the neck, arm or lower back region (prevalence rates ranging from 24 to 39%), the majority of surgeons (50% or more) who reported a physical complaint felt that their work was partly responsible for developing these complaints. In addition, a third of the surgeons (30% or more) having a physical complaint in the arm and knee regions felt impaired in their work functioning. The majority of surgeons (86%) reported that their physical state rarely affected their ability to cope with the physical job demands of their jobs; nevertheless, one out of every seven surgeons (14%) regularly had difficulties coping with these demands due to impairments in their physical well-being. These findings constitute a warning that a number of surgeons are at risk for long-term sickness absence because of either reduced work ability or the presence of a physical health complaint.[12,16] Furthermore, reduced work ability is associated with reduced job performance and therefore poses a threat to the quality of care and, consequently, patients' safety.[17]

In this study, a representative sample from one population of surgeons and hospital physicians was used to gather information. With 51% of the subjects completing the questionnaire, data about physical demands, physical health complaints and work ability are considered to be representative of the population. In addition, by following a measurement strategy for systematic observations that takes into account the variation in the frequency and duration of physical demands between and within workdays, the quantified physical demands are a reliable representation of the exposure to physical demands during an average workday. Altogether, it is justified to conclude that the physical demands of performing surgery are a threat to surgeons' physical health, work ability and job performance. However, we cannot rule out over- or under response between the two groups and the generalization of these results might be restricted to other medical centers, while it is conceivable that surgeons in district hospitals might perform less difficult or complex operations.

To keep surgeons healthy on the job and to ensure a high quality of care, it appears necessary to take preventive measures that aim to reduce their physical strain. While job demands often cannot be easily reduced, a possible preventive measure would be to provide surgeons with sufficient recovery opportunities during the day. Empirical evidence shows that recovery from work is positively related to an employee's health and

well-being, as well as to job performance.[18,19] Currently, surgeons often lack recovery opportunities during surgery that could be achieved, for example, by a change in body posture. The lack of recovery opportunities becomes increasingly troublesome during an extensive surgical procedure. As a result, surgeons experience increased stress and fatigue throughout an operation, which may have an impact on the surgeon's accuracy and the operation's outcome.[20] Providing on-the-job recovery opportunities during an operation, such as taking micro pauses or changing surgeons[20], could be an important prerequisite for not feeling strained or becoming fatigued and, instead, for performing well.

In reality, adopting awkward positions during difficult and prolonged surgical procedures is sometimes inevitable, and taking micro pauses or changing surgeons during a surgical procedure is impossible.[20] In that case, circulating between tasks during a workday might provide additional recovery opportunities. Instead of performing several surgical procedures during one part of the workday, it is recommended that surgeons recover from surgery-induced physical strain by changing to less physically demanding tasks, such as ward rounds or report-writing, between surgical procedures. Finding ways to recover from physically strenuous work is important, because chronic exposure to physically demanding work and incomplete recovery is an important pathway to chronic health impairment.[21]

In addition to exposure to high physical demands, the presence of high psychological job demands in combination with high physical demands has shown an even stronger relationship with the presence of physical complaints.[22] A high work-load with long working hours and a low decision latitude are examples of psychological job demands that surgeons and other hospital physicians experience.[23] Therefore, in addition to providing recovery opportunities for coping with the physical job demands, it is suggested that interventions are sought that aim to optimize the psychological work environment of surgeons, thereby reducing exposure to psychological job demands.

Appendix 1

TABLE 6 Hierarchical task analysis – physical variables of interest

Variable	Categories
Activities	Sitting
	Standing
	Walking
	Kneeling/squatting
	Working on a computer
	Walking the stairs
	Fine motoric movements
	Gross motoric movements
	Carrying
	Lifting
	Pushing / Pulling
Body postures	Lumbar flexion (> 60°)
	Lumbar rotation (> 20°)
	Cervical flexion (> 25°)
	Cervical rotation (> 25°)
	Asymmetric posture
	One or two arms above shoulder height
	Reaching

Appendix 2

TABLE 7 Physical complaints reported in each body region for surgeons and other hospital physicians

Physical complaints	**Surgeons** *(n=91)*		**Hospital physicians** *(n=281)*	
	%	*(n)*	*%*	*(n)*
Neck	35	(32)	29	(82)
work-related	84		67	
work-impairing	13		15	
Upper back	19	(17)	14	(39)
work-related	71		74	
work-impairing	18		13	
Lower back	24	(22)	25	(69)
work-related	59		38	
work-impairing	18		16	
Shoulder	23	(21)	15	(43)
work-related	71		61	
work-impairing	48		23	
Elbow	4	(4)	4	(12)
work-related	75		58	
work-impairing	25		42	
Forearm	3	(3)	5	(14)
work-related	67		57	
work-impairing	33		43	
Wrist/hand	15	(14)	13	(36)
work-related	57		53	
work-impairing	57		31	
Hip	4	(4)	6	(17)
work-related	25		0	
work-impairing	25		6	
Knee	2	(2)	7	(20)
work-related	50		15	
work-impairing	50		10	
Leg	2	(2)	3	(7)
work-related	100		0	
work-impairing	0		43	
Ankle/foot	2	(2)	8	(23)
work-related	50		17	
work-impairing	0		17	

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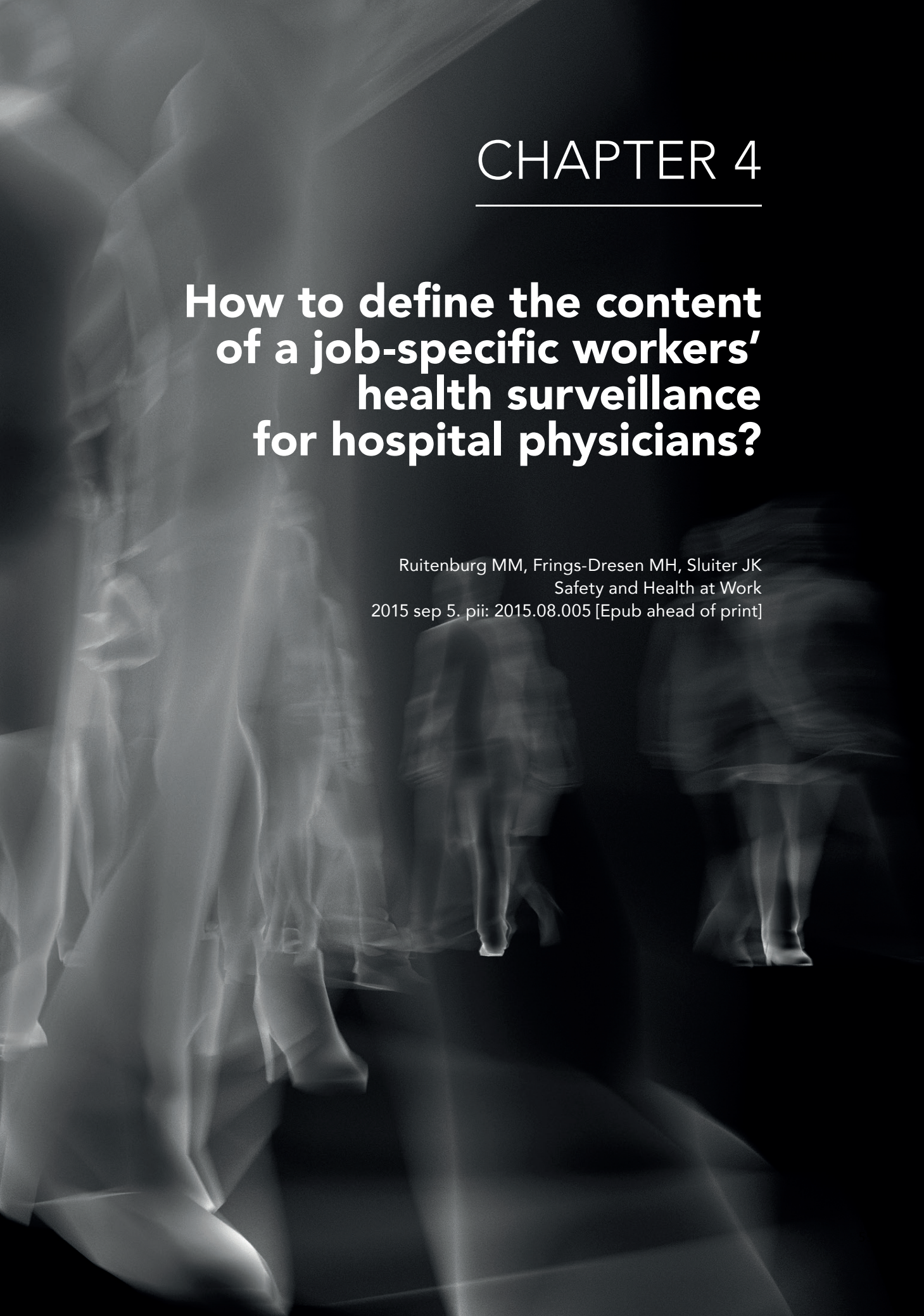

CHAPTER 4

How to define the content of a job-specific workers' health surveillance for hospital physicians?

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Abstract

Background
A job-specific WHS for hospital physicians is a preventive occupational health strategy aiming at early detection of their diminished work-related health in order to improve or maintain physician's health and quality of care. This study addresses what steps should be taken to determine the content of a job-specific WHS for hospital physicians and outlines that content.

Methods
Based on four questions, decision trees were developed for physical and psychological job demands and for biological, chemical and physical exposures to decide whether or not to include work-related health effects related to occupational exposures or aspects of health reflecting insufficient job requirements. Information was gathered locally through self-reporting and systematic observations at the workplace and from evidence in international publications.

Results
Information from the decision trees on the prevalence and impact of the health- or work functioning effect led to inclusion of occupational exposures (e.g. biological agents, emotionally demanding situations), job requirements (e.g. sufficient vision, judging ability) or health effects (e.g. depressive symptoms, neck complaints). Additionally, following the Dutch guideline for occupational physicians and based on specific job demands, screening for cardiovascular diseases, work ability, drug use and alcohol consumption was included. Targeted interventions were selected when a health- or work functioning problem existed and were chosen based on evidence for effectiveness.

Conclusion
The process of developing a job-specific WHS for hospital physicians was described and the content presented , which might serve as an example for other jobs. Before implementation it must first be tested for feasibility and acceptability.

Introduction

Hospital physicians are exposed to several occupational risk factors that can lead to work-related health complaints. Occupational exposure to biological or chemical substances[1,2], to physical job demands like adopting uncomfortable and exhausting working postures[3] or to psychological job demands such as experiencing violence[4] or the death of a patient[5] are common in the work of hospital physicians. Work-related health complaints that have previously been associated with occupational exposures in the work of hospital physicians are, among others, complaints in the neck[6,7] and lower back[3,7] region and symptoms of stress[8] and burnout.[8,9] A reduced health status of hospital physicians in relation to work is associated with reduced work ability[8], threatening quality of care and potentially putting patients' safety at risk.[10] Focusing on prevention or early detection of diminished health might not only increase the well-being of hospital physicians, but could also maintain or improve quality of care and secure patients' safety better.

One of several preventive occupational health strategies that can be offered to employees to maintain or improve work-related health is a periodic Workers' Health Surveillance (WHS).[11] In the Netherlands, an employer is by legislation required to periodically offer a WHS to its employees. In a collective agreement the employer and a labour-union can make additional agreements on the frequency and timing of offering a WHS. While the employer is responsible for financing the WHS, an independent occupational health service is primarily responsible for the content and organisation of the WHS, which also includes keeping records of the data. Participation of the employee is voluntarily.

The central purpose of the WHS targets prevention of occupational and work-related diseases and injuries.[12] Internationally, WHS aims at detecting unhealthy occupational exposures and/or the prevention or early detection of health complaints that can be related to occupational risk factors.[12] In the Netherlands, WHS encompasses inviting employees to perform medical examinations, followed by an individual consultation with the occupational physician where individual feedback is followed by advice on targeted interventions when applicable.[13] Follow-up consultations are planned with the occupational physician to register to what extent the advice or intervention is followed and/or the work-related health or work-functioning of the employee has improved. On a group level, results of the medical examinations can be reported to the employer together with an advice or recommendation on organisational level.

In the case of work consisting of specific job demands, interventions to prevent work-related health problems might be directed towards increasing personal abilities to deal with these job demands. Specific job demands are defined as job demands with a risk of work-related health problems or diminished safety that cannot be reduced by adjusting working procedures and that exceed exposure safety levels or average human capacity to meet such demands on a daily basis.[14] To that end, by taking a more health-centred approach, the WHS monitors and promotes an individual's health in relation to work. It focuses particularly on the question of whether worker's health is sufficient to meet the demands of the job.[13]

These purposes of the WHS imply a job-specific approach rather than a general one. Following the ILO guidelines, WHS should take into account the occupational hazards in the workplace and the health requirements of the work, to make sure the surveillance of worker's health is appropriate to the occupational risks of the job.[12] Whereas the ILO considers investigating occupational risk factors as part of the WHS, in the Netherlands this is regulated differently and is done prior to the WHS in a so-called structured risk assessment and evaluation. This job-specific approach of a WHS is necessary because in the case of work-related health complaints, attention should be directed at finding the exact mismatch between job demands and the individual's abilities to meet these demands.[15] Furthermore, not only does a job-specific approach of a WHS allow for interventions that best fit with the occupation of interest – therefore increasing the likelihood of effective interventions to increase work functioning – but workers should also be protected from an abundance of screening tests and assessments that do not forecast how well they perform their job.[16]

In conclusion, to maintain and improve the work-related health of hospital physicians, which will positively affect the quality of care and help secure patient safety, a job-specific WHS for hospital physicians should be developed. Because we have observed that a culture is lacking in Dutch hospitals of focusing on preventing work-related health problems, we developed a job-specific WHS for hospital physicians. In this study the question of what steps should be taken to arrive at a job-specific WHS and the question of what the content of a job-specific WHS for hospital physicians should be addressed.

Materials and methods

To determine the content of the job-specific WHS for hospital physicians, a decision tree was developed based on answers to four questions (see Figure 1). Sub decision trees were developed for the different type of job demands and occupational exposures. Irrespective of the type of demands or occupational exposures, all decision trees were designed to establish whether or not to include work-related health effects known to be related to job demands, or whether or not to include aspects of health that reflect insufficient job requirements of the individual hospital physician to meet the demands of the job.

Before question one of the decision tree could be answered (see Figure 1), occupational exposures and job demands in the work of hospital physicians needed to be identified. Information regarding physical job demands was gathered in two ways: through self-reporting or direct observations of hospital physicians of one Academic Medical Center in the Netherlands.[8,17] Direct observations, to gather data in terms of duration, frequency and intensity, and data regarding mean and peak energetic load, were performed during the work of 126 hospital physicians.[3,17] To account for the differences in tasks and activities between several medical specialties, the physical job demands were reported, when possible, for three clusters of medical specialties. The clusters of medical specialties were: observational medical specialties (e.g. Internal Medicine), supportive (e.g. Radiology) and surgical (e.g. General Surgery). Psychological job demands and biological exposures were obtained from evidence-based information from international studies, and locally through self-reporting.[8] Insight into

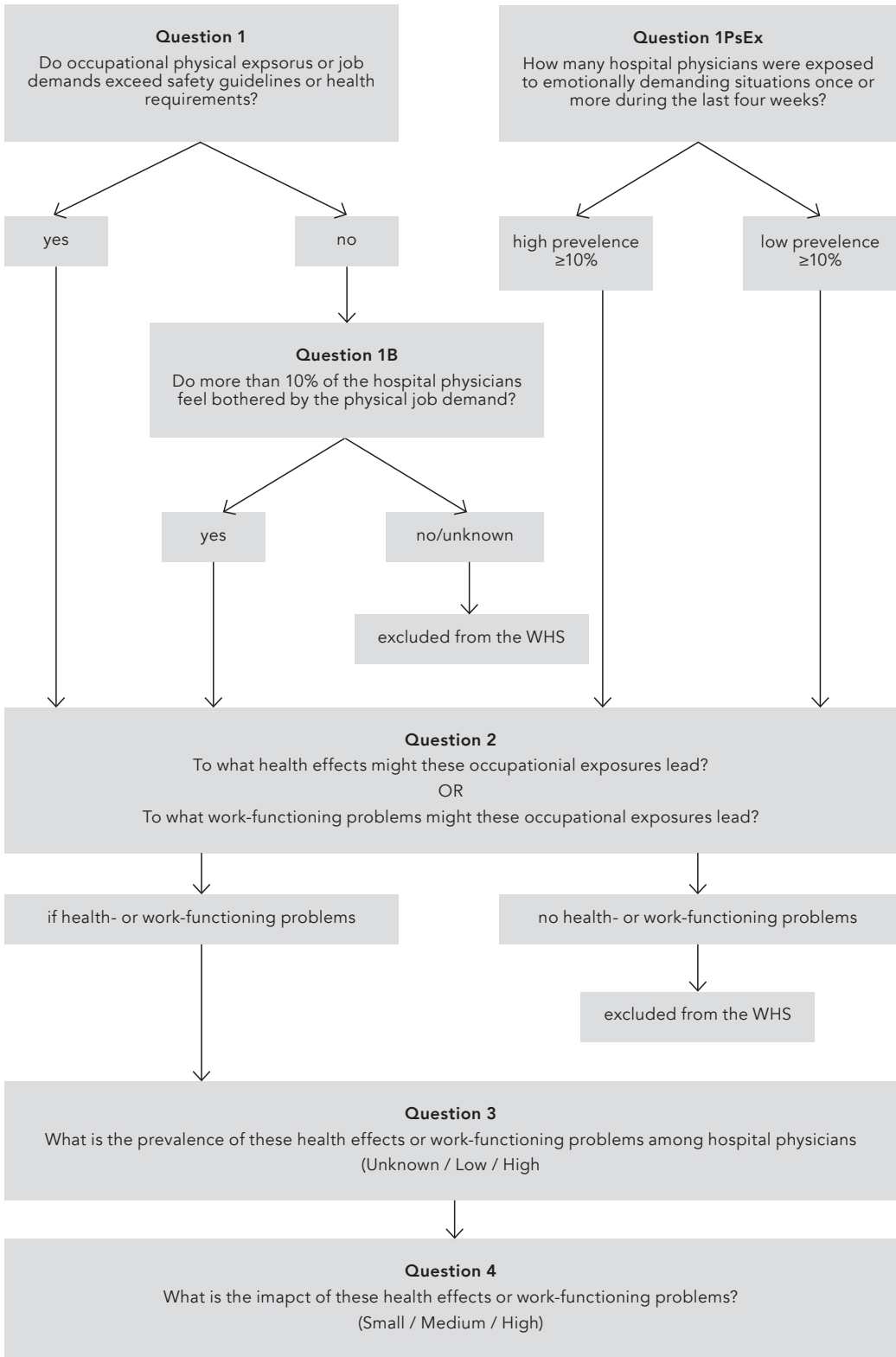

FIGURE 1 Decision tree for occupational exposures and job demands with stepwise question-checking

chemical and physical exposure was obtained through international evidence.[17] Once the occupational physical exposures and job demands were identified, they were compared with guidelines of occupational exposures and job demands, e.g. with Dutch guidelines of occupational exposures and job demands (Figure 1, question 1).[18] When the occupational physical exposures and job demands did not exceed these guidelines, but a considerable proportion of hospital physicians felt bothered by the physical job demand (Figure 1, question 1B), it was still considered a potential threat to good health and work-functioning. Question 1PsEx served to gather information regarding the prevalence of emotionally demanding situations, thereby contributing to the evidence base of the WHS. A cut-off of 10% was established beforehand, because this cut-off was used in the final process of deciding on in- or exclusion in the WHS. Data that were needed to answer questions 1B and 1PsEx (see Figure 1) of the decision tree were obtained locally through self-reporting by 900 hospital physicians and medical residents and through evidence-based information from international literature.[8,17]

Regarding the second and third questions of the decision tree (see Figure 1), identifying health- and work functioning problems that could either be related to the occupational exposures or reflect a lack of resources on the part of the hospital physicians to cope with the job demands, and the prevalence of these health effects among hospital physicians was done by looking for international evidence, and locally through self-reporting by 900 hospital physicians and medical residents.[8,17] With respect to question three, our expert group of researchers decided to label the prevalence of health effects as 'high' when exceeding a prevalence rate of 10% or when this was higher among hospital physicians compared to the general population.

To answer the fourth research question (see Figure 1), our expert group of researchers identified three aspects to decide upon the impact of the specific health- or work functioning problem: i) whether it bothered the individual worker, ii) whether it led to restrictions in daily work functioning; and iii) whether it formed a potential risk for others. When hardly bothering the individual, hardly restrictive in daily work function and no risk for others, the impact was considered small. The impact was labelled as medium when the health effect was bothering the individual in some way, but was not restrictive in daily work functioning nor posing a risk for others. When a health problem was significantly restrictive in daily work functioning and/or formed a potential risk for others, the impact was considered high.

In the result section, the main focus is on clarifying the content of the WHS, which starts with describing which aspects of the job demands or job requirements should be included in the job-specific WHS based on the results of our decision trees. Subsequently, the results will focus on how these aspects were measured in the WHS, how a signal of occupational exposures exceeding health- or safety guidelines or of a reduced health status was detected, and what interventions the occupational physicians could perform in the case of such a signal.

Results

First of all, the questions of the decision trees were answered for the different types of occupational exposures, job demands and job requirements. To finally decide whether or not to include the occupational exposure, job requirement or health effect in the job-specific WHS , a-priori decision rules were followed that used the information resulting from the questions of the decision trees. For both the physical job demands and the biological, chemical and physical exposures, screening of the health- or work-functioning problems was included when: i) the prevalence of the health- or work functioning effect was high and the impact medium or big; or ii) the prevalence of the health- or work functioning effect was low or unknown, but the impact big. Regarding the psychological job demands, other rationales were formed. Screening of the health effects was included in the WHS in one of the following cases: i) prevalence of the emotionally demanding situation was high and the impact medium or big; or ii) accidental exposure to the emotionally demanding situation is sufficient to lead to health- or work-functioning problems and the impact of these problems is medium or big; or iii) prevalence of the emotionally demanding situation is low, but the impact is considered big. Table 1 lists some examples of how these decision trees and decision rules were followed for different occupational exposures, job demands or job requirements.

TABLE 1 Steps taken in following decision trees: examples of different occupational exposures, job demands and job requirements

	Question 1	*Question 1B*	*Question 2*	*Question 3*	*Question 4*	*Inclusion WHS?*
Physical job demands						
VDU work	Yes	→	Complaints in: Neck Shoulder Wrist/Hand	 High (31%) High (17%) High (13%)	Medium / High	Yes
Fine motor movements (surgical specialisms)	Yes	→	Complaints in: Neck Shoulder Wrist/Hand	 High (31%) High (17%) High (13%)	Medium / High	Yes
Physical job requirements						
Sufficient vision	Yes	→	Work-functioning problems due to reduced sight	→	High	Yes

Continuing for Table 1	*Question 1*	*Question 1B*	*Question 2*	*Question 3*	*Question 4*	*Inclusion WHS?*
Biological / Chemical exposure						
Biological agents	Yes	→	Hepatitis B HIV Diarrhoea, etc.	Unknown	High	Yes
Halothane in OR	Yes	→	Irritation of skin, eyes and/ or respiratory tract	Unknown	High	Yes
Benzene	No	Unknown	→			No
Psychological job demands						
Verbal aggression by patients	High prevalence (20%)	→	Depressive symptoms Anxiety symptoms	High (29%) High (24%)	High	Yes
Death of a patient (once or more during the last four weeks)	High prevalence (26%)	→	Stress Burnout	High (15%) Low (6%)	High	Yes

In addition to the inclusion of job demands, occupational exposures and job requirements resulting from the decision tree, specific or safety job requirements were included in the WHS, given the existing Dutch guidelines for occupational physicians and the guide on specific job demands.[18] For example, the work of hospital physicians requires them to maintain a heightened state of alertness 24/7. In acute complex situations they need to be able to act quickly and adequately. Screening in the WHS on aspects that could negatively affect the ability to maintain this heightened state of alertness was therefore found to be feasible and relevant. These aspects include the chosen content of screening for psychological health complaints (e.g. depressive symptoms), drug use and alcohol consumption. Furthermore, with the aim of maintaining and promoting the health status of hospital physicians in relation to their work, monitoring risk factors for developing cardiovascular diseases was found relevant to be included in the WHS as well. Finally, to detect general problems that might affect the work ability of the hospital physicians, the self-reported Work Ability Index[19] was included as well as enquiring after all other non-addressed health problems that might affect their work ability. An overview of the WHS protocol is shown in Table 2.

TABLE 2 Topic list and measurement protocol of the job-specific WHS for hospital physicians

	Aspect of job requirement or job demand to be included in WHS	**Instrument used in WHS** *(Written signalling question / Validated screener / Validated test / Direct measurement)*	**Outcome measures**	**Signal when:**
Physical job requirements				
Musculoskeletal system		**Signalling question**	yes / no	Outcome is 'yes'
Neck flexion and rotation Standing Sitting	Neck complaints Lower back complaints Shoulder complaints Hand/wrist complaints	'Did you experience recurrent and/or prolonged complaints in [body region] during the last six months?'		
Computer work Fine motor skills		If yes, do you feel impaired in executing your work because of this complaint? (yes / no)	yes / no	Outcome is 'yes'
Sufficient vision	Problems with vision	**Signalling question** [20,21] 'Do you have trouble reading during your work?'	yes / no	Outcome is 'yes'
				or
		Vision test [20,21] Landolt C rings, distance 40 and 60 cm (both eyes together; if job demand includes using only one eye, also eyes separately)	Eyes together Left eye Right eye	score vision test <0.8
Sufficient hearing	Problems with hearing	**Signalling question** 'Do you have trouble hearing during your work?'	yes / no	Outcome is 'yes' or
		Hearing test [22] Whisper test - 6 combinations per ear	Number of errors per ear (range 0 – 6)	number of errors whisper test per ear >4

	Aspect of job requirement or job demand to be included in WHS	**Instrument used in WHS** *(Written signalling question / Validated screener / Validated test / Direct measurement)*	**Outcome measures**	**Signal when:**
Physical job demands				
Exposure of skin to solid or liquid substances	Work-related skin complaints (e.g. contact dermatitis)	**Signalling question** 'Do you currently experience skin complaints on arms or hands?'	yes / no	Outcome is 'yes'
Risk of infectious diseases	Experiencing bite- or needle stick accident	**Signalling question** 'Have you recently (during the last four weeks) experienced a bite- or needle stick accident?'	yes / no	Outcome is 'yes'
	Exposure to body material	'Have you recently (during the last four weeks) been exposed to body material of patients?'	yes / no	Outcome is 'yes'
	Presence of infectious diseases that pose a risk to others	'Do you currently have an infectious disease?	yes / no	Outcome is 'yes'
Exposure of respiratory tracts or lungs to dust, smoke, gas or vapour	Work-related complaints of lungs or respiratory tract (e.g. COPD or asthma)	**Signalling question** 'Do you currently experience complaints with your respiratory tracts or lungs?'	yes / no	Outcome is 'yes'
Psychological job demands				
Emotionally demanding situations	Recently experienced aggression	**Signalling question** 'Did you recently experience….. …. aggression from a patient towards yourself or a colleague? .... aggression from a colleague or supervisor towards yourself?	yes / no yes / no	Outcome is 'yes' Outcome is 'yes'
	Recently experienced trauma	'Did you recently experience….. .... a severe traumatic incident?	yes / no	Outcome is 'yes'

	Aspect of job requirement or job demand to be included in WHS	Instrument used in WHS *(Written signalling question / Validated screener / Validated test / Direct measurement)*	Outcome measures	Signal when:
Psychological job requirements				
Alertness and judging ability	PTSD	**Screener: Dutch Impact of Event Scale (SVL)** [23,24]	Score 0-75	Score ≥ 20
	Drug use	**Signalling question** 'Do you use drugs?'(yes / no) If yes, which? - Painkillers - Tranquilizers - Sleeping aids - Other….	yes / no yes / no	Outcome signalling question is 'yes' Outcome signalling question is 'yes'
	Sleepiness	**Screener: Epworth Sleepiness Scale** [25]	Score 0-24 Score 0-12	Score ≥ 10 Men: score ≥ 5
	Alcohol consumption	**Screener: AUDIT-C** [26]		Women: ≥ 4
	Depressive symptoms Anxiety symptoms Stress symptoms	**Screener: GHQ-12** [27]	Score 0-12 Score 0-11	Score ≥ 4 Score > 5
	Work-related fatigue	**Screener: Need for Recovery after work scale** [28-30]		
Work ability				
	Current self-reported work ability	**Screener: Work Ability Index – first item (score 0 (lowest ever) – 10 (highest ever))** [19,31]	Score 0-10	Score ≤5
	Other prevalent health effects	**Signalling question** 'Are there any health effects related to your work that have not been asked about yet, but that you would like to discuss?'	yes / no	Outcome is 'yes'

	Aspect of job requirement or job demand to be included in WHS	**Instrument used in WHS** *(Written signalling question / Validated screener / Validated test / Direct measurement)*	**Outcome measures**	**Signal when:**	
Risk factors cardiovascular diseases				**Points for summing Dutch CVD risk profile**	
Risk profile		**Signalling question** 'Does/did your father, mother, brother or sister have….		Male	Female
	Prevalence of diabetes in family	…diabetes type 2?'	yes / no	Yes: 4	Yes: 3
	Prevalence of cardiovascular diseases in family	…have a cardiovascular disease before age 65?'	yes / no	Yes: 1	Yes: 4
	Smoking	'Do you smoke?'	yes / no	Yes: 9	Yes: 9
	Waist circumference	**Measurement**	cm's	≥ 94 cm: 3	80-88 cm: 2 ≥ 88 cm: 6
	Body mass Index (BMI)	**Measurement**			
		BMI = Weight / (Length x Length)	Weight (kg), Length (m), BMI	25 - < 30: 4 ≥ 30: 12	25 - < 30: 4 ≥ 30: 7
	Age	**Written question**	Age in years	Male < 45: 0 45-49: 13 50-54: 17 ≥ 55: 22	Female < 45: 0 45-49: 10 50-54: 16 ≥ 55: 23
Signal when – Male: total points <30 with risk factor OR total points ≥30 / Female: total points <35 with risk factor OR total points ≥35					
		Measurement			
	Systolic and diastolic blood pressure	Digital blood pressure reading (3 times) [32]	Systolic blood pressure Diastolic blood pressure		≥ 140 mmHg ≥ 90 mmHg

After the job-specific demands, exposures and health- or work functioning problems were selected that needed to be included in the WHS, targeted interventions were selected when a health- or work functioning problem existed. These interventions were chosen on their evidence for effectiveness and could be targeted at increasing the personal abilities or capacities of the individual hospital physician to cope with the job demands, or they could consist of (ergonomic) measures or medication or act on the individual organisation of work interaction to reduce the occupational exposures and/or the resulting health- or work functioning problems. The interventions were mainly based on existing national and international guidelines, for example guidelines of the Netherlands Society of Occupational Medicine (NVAB). An overview of the interventions proposed for each possible signal is shown in table 3.

TABLE 3 Interventions for the occupational physician based on the results of the screening questionnaire and physical measurements

Physical job requirements				
			Intervention choice based on:	
	Outcome	**Personal abilities / capacity**	**Measures / Medication**	**Individual-work interaction**
Musculoskeletal system				
Lower back complaints	Signalling question 'yes', no impairment during work	□ Discuss relevant tasks and activities within medical specialty of employee □ Inquire about nature, origin and development of current complaints and possible impairments[33] □ Consider referral to general practitioner or specialized consult		□ Discuss task, activities and work-rest schedule □ In the case of impairments in work, advise to discuss outcome with manager
	Signalling question 'yes' and impairment during work	□ If work-related complaints, arrange for occupational disease notification □ In the case of reduced personal capacity, advise specific exercises to increase personal capacity[33] □ Follow-up within six weeks		
Neck, shoulder or hand/wrist complaints	Signalling question 'yes', no impairment during work	□ Discuss relevant tasks and activities within medical specialty of employee □ Inquire about nature, origin and development of current complaints and possible impairments[34] □ In the case of shoulder- or hand/wrist complaints due to excessive computer use: advise micro-breaks[35]	□ In the case of computer work: consider advising support for hand/wrist[35] □ In the case of complaints due to use of mouse: advise switching arms or advise alternative mouse[35]	□ Discuss task, activities and work-rest schedule □ In the case of impairments in work, advise to discuss outcome with manager
	Signalling question 'yes' and impairment during work	□ In the case of complaints due to other tasks: discuss impairments in work and discuss possibilities of adjustments in organisation of work and work environment[34] □ If work-related complaints, arrange for occupational disease notification □ Follow-up within six weeks	□ In the case of mainly sitting work at workplace, discuss workplace investigation by ergonomist[35] □ In the case of non-computer related complaints: discuss impairments in work and investigate possible ergonomic interventions	

		Intervention choice based on:		
	Outcome	**Personal abilities / capacity**	**Measures / Medication**	**Individual-work interaction**
Sufficient vision	Signalling question 'yes' or vision test <0.8	□ If tasks performed with one eye: measure eyes separately □ If reduced vision for 60 cm, consider advising screen glasses □ Refer to optician □ Follow-up within four weeks		□ In the case of impairments in work, advise to discuss outcome with manager
Sufficient hearing	Signalling question 'yes' or >4 errors for one ear	□ Discuss impairments during meetings or other activities □ Make tone audiogram or perform test with computer of audiological centre (silence required) □ Follow-up within four weeks	□ Advise to get hearing aid □ Refer to ENT doctor or audiologist if results suggest this □ When programme for hearing protection seems applicable: use guideline for Preventive Occupational Hearing reduction[36]	□ In the case of impairments in work, advise to discuss outcome with manager and colleagues □ Discuss possible sources of exposure
Physical exposures				
Exposure of skin to solid or liquid substances	Signalling question 'yes'	□ Inquire about current complaints and impairments □ Discuss possible causes □ Consider specialized interventions □ If work-related complaints, arrange for occupational disease notification and use the registration guideline 'Occupational contact dermatoses'[37] □ In the case of contact eczema: investigate reduction of exposure to skin irritating factors, advise skin protection, skin cleaning and skin moisturizing [38] □ Follow-up within four weeks	□ Advise personal protection resources	□ Explore possibilities of reducing exposure □ In the case of impairments in work, advise employee to discuss outcome with manager (and perhaps colleagues who could temporarily take over tasks and activities)

		Intervention choice based on:		
	Outcome	**Personal abilities / capacity**	**Measures / Medication**	**Individual-work interaction**
Risk of infectious diseases	Signalling question 'yes'	□ Strategy to carry out is dependent on infectious disease, use hospital-specific guideline 'Hospital workers and infectious diseases' □ Discuss influence on work functioning		□ In the case of impairments in work, advise to discuss outcome with manager
Needle stick- or bite accident	One or both signalling question 'yes'	□ Discuss whether 'PEP protocol' for needle stick-, bite- or sex accidents was followed, inclusive of testing. When necessary, advise additional actions	□ When necessary, prescribe suitable medication	
Exposure of respiratory tracts or lungs to dust, smoke, gas or vapour	Signalling question 'yes'	□ Check current complaints and subsequent impairments and investigate work-relatedness □ If work-related complaints, arrange for occupational disease notification □ Consider specialized interventions □ In the case of regular or chronic exposure to dust, smoke and vapour (smoking included): consider additional research for early diagnosis of COPD[39] □ In the case of COPD, choose possible interventions: stop smoking, adjustment of work/working schedule, reduction inhaling exposure, lung recovery[39] □ Decide whether it is a case of asthma: does the employee experience complaints of respiratory tracts or lungs in combination with dyspnoea, wheezing on the chest and/or coughing, and complaints free periods, signs of allergy cause, eczema, atopic or asthma in anamnesis? In that case, it could be asthma. Then apply the steps from the asthma and COPD guideline[39] □ Follow-up within four weeks	□ Consider resources or inhaler	□ Explore possibilities of reducing exposure □ In the case of impairments in work, advise employee to discuss outcome with manager

Psychological exposures				
			Intervention choice based on:	
	Outcome	**Personal abilities / capacity**	**Measures / Medication**	**Individual-work interaction**
Emotionally demanding situations				
Traumatic experience	Signalling question on traumatic experience 'yes'	□ Check the score on the Impact of Event Scale (see below) □ Discuss the item and consider advising the module 'Resilience' on www.ephysicianhealth.com[40]		
Aggression	'yes' on one or both signalling questions on experienced aggression in work	□ When related psychological complaints are also present, consider arranging for occupational disease notification □ In the case of work-related aggression, refer to www.ephysicianhealth.com[40], module 'Disruptive behaviour' or module 'Resilience' □ Inquire whether appropriate care was delivered right after the incident □ Consider giving the employee 'Aggression composure and handling' or 'Aggression and Violence, relief and after care' brochures □ Consider training and counselling		□ In the case of impairments in work, advise employee to discuss outcome with manager
Individual's psychological resources				
Alertness and judging ability				
	Score Impact of Event Scale[23]: 20-25 and Score > 25	□ If work-related complaints, arrange for occupational disease notification □ Consider advising to use www.ephysicianhealth.com[40] and follow the 'Resilience' module to reduce general stress complaints.	□ If accompanied by depressive complaints, discuss use of drugs (see depression guideline NVAB)[41]	□ In the case of impairments in work, advise employee to discuss outcome with manager

		Intervention choice based on:		
	Outcome	**Personal abilities / capacity**	**Measures / Medication**	**Individual-work interaction**
	Contuining for score Impact of Event Scale	Score 20-25 □ Take note of the experienced trauma □ Discuss whether one-time coaching/counselling session is desired □ Follow-up within four weeks Score > 25 □ Discuss whether coaching or counselling is desired □ In the case of severe PTSD, advise therapy (cognitive-behavioural therapy, EMDR or Imaginary Exposure) □ In the case of severe PTSD, check for depression □ Make a follow-up appointment		
Drug use	Signalling question 'yes'	□ Discuss current drug use and potential influence on work functioning □ Consider advising www.ephysicianhealth.com[40] and the use of 'Substance use' module □ In the case of addiction, refer to specialized clinic □ Arrange for follow-up appointment by phone within six weeks		
Sleepiness	Score Epworth Sleepiness Scale[25] ≥ 10	Score 10-15 □ Discuss situational causes Score >15 □ Consider specialized consult (sleeping expert) and arrange for follow-up appointment	 Score > 15 □ Consider prescribing drugs	Score 10-15 □ Discuss temporary adjustments in work Score > 15 □ With impairments in work, advise employee to discuss outcome with manager and advise dayshifts temporarily

		Intervention choice based on:		
	Outcome	**Personal abilities / capacity**	**Measures / Medication**	**Individual-work interaction**
Alcohol consumption	AUDIT-C[26] score: Male ≥ 5 Female ≥ 4	□ Discuss outcome in relation with health risks and patient safety □ Consider advising the 'Substance use' module on www.ephysicianhealth.com[40] □ Consider advising autonomous intake reduction by using the free online course 'Drinking less'[42] □ In the case of drinking abuse or high dependency: refer to general practitioner who can make use of the 'Obstacles in the use of alcohol'(2009) guideline[43] □ In the case of addiction, refer to specialized clinic □ Arrange for follow-up appointment by phone within six weeks		
Depressive, anxiety and/ or stress symptoms	Score GHQ-12[27]: ≥ 4	□ If work-related complaints, arrange for occupational disease notification □ Consider to advise using www.ephysicianhealth.com[40] to run through the 'Resilience' module to reduce general stress complaints □ When GHQ-score ≥ 4, following actions include: Step 1: employee fills out additional validated questionnaires specifically for depressive- (BSI-DEP[44]) and anxiety (BSI-ANG[44]) symptoms Step 2-a: in the case that one or both scores >0.41: □ Discuss possible causes of complaints □ Consider specialized interventions □ Assess the psychosocial work environment[45]	□ Consider after diagnosis, medication and/or treatment or therapy according to national guideline[41] □ When increasing personal abilities by specialized interventions does not result in any effects within six weeks, with a mild to average depression for a period longer than 3 months….	□ Discuss temporary adjustments in work content □ In the case of impairments in work, advise employee to discuss outcome with manager

		Intervention choice based on:		
	Outcome	**Personal abilities / capacity**	**Measures / Medication**	**Individual-work interaction**
	Continuining for score GHQ-12 [27]*:* *≥ 4*	□ In the case of first, mild depressive symptoms, consider giving education, psycho-education or an online self-help course 'Colour your life', or problem-solving therapy and regular control (national depression guideline[41] and arrange for follow-up appointment within six weeks □ Consider a combination of cognitive-behavioural interventions and relaxation in the case of depressive complaints[45] □ Arrange for follow-up appointment within six weeks Step 2-b: in the case of none of the scores > 0.41: □ Discuss causes of complaints □ Support when necessary in taking recovery steps by simple cognitive-behavioural interventions, e.g. offering a rational perspective, daily structures, positive restructuring[46] □ Enhance problem-solving abilities of the employee, manager and assess the interaction between both[46]	….or in the case of severe or recurrent depression: treatment with pharmacotherapy and/or psychotherapy (for criteria choice of treatment consult the national depression guideline: for occupational physician[41]	
Work-related fatigue	Score VBBA scale 'Need for recovery'30 >5	□ Discuss influence of fatigue on work-life balance □ Discuss recovery opportunities[29] during the workday □ Advise using the 'Burnout' module on www.ephysicianhealth.com[40] to prevent burnout or the 'Resilience' module		□ Consider organisation interventions proposed by Dunn et al. (2007)[49] to improve work-life balance: - when possible, adjust the work to the aim of the hospital physician - Discuss the possibility of flexible working schedule

		Intervention choice based on:		
	Outcome	**Personal abilities / capacity**	**Measures / Medication**	**Individual-work interaction**
	Continuing for score VBBA scale 'Need for recovery'[30] *>5*	□ In the case of severe complaints, consider using the Maslach Burnout Inventory[47] and arrange for occupational disease notification when: score scale depersonalization ≥ 10 and/or score scale emotional exhaustion ≥ 27 □ When available, use burnout guideline [48] □ Follow-up within six weeks		- Discuss possibilities to put more emphasis on the interests of the hospital physician - Temporary reduction of the administrative tasks □ In the case of impairments in work, advise to discuss outcome with manager □ Discuss risk factors of workload (time pressure, deadlines, quantity of work), recovery opportunities, work-rest balance, social relationships.
Work ability				
Work ability	When score first item of Work Ability Index[19] ≤ 5	□ Discuss situational causes □ Discuss influence on work functioning and work-life balance □ Investigate causes of reduced individual capacities and start suitable interventions to increase work ability □ Advise employee to have a solution-orientated conversation with their manager □ Arrange for follow-up appointment within six weeks		

			Intervention choice based on:	
	Outcome	**Personal abilities / capacity**	**Measures / Medication**	**Individual-work interaction**
Other health aspects in relation to work	Signalling question 'yes'	□ Discuss health complaint and influence on work functioning		
Cardiovascular diseases				
	Outcome	**Personal abilities / capacity**		
Calculate score risk profile		Age < 45 years: □ When risk factors are present, give targeted lifestyle advices or, when risk factors are absent, give generic lifestyle advice (using www.testuwleefstijl.nl)[50] and/or refer to the 'Weight, nutrition and fitness' module on www.ephysicianhealth.com. Employees currently having diabetes or cardiovascular diseases: □ Discuss whether there are impairments in work □ Discuss whether the employee is currently under specialized control		
	Orange Male: score risk profile <30 with risk factor smoking or obesitas Female: score risk profile < 35 with risk factor smoking or obesitas	Orange: □ Give lifestyle advice targeted at the risk factors present and/or refer to www.ephysicianhealth.com[40] to follow the 'Weight, nutrition and fitness' module.		

		Intervention choice based on:
	Outcome	**Personal abilities / capacity**
Continuing for cardiovascular diseases	Red: Male: score risk profile ≥ 30 Female: score risk profile ≥ 35 AND / OR Employee currently having diabetes or cardiovascular diseases	Red: □ Discuss results and give lifestyle advices □ Discuss whether the employee prefers to have an extended profile assessed by the general practitioner or by the occupational physician. In the latter case: □ Perform additional lab research (lipids spectrum and blood glucose level) □ Complete a risk profile using SCORE □ Risk communication □ Give targeted and specific lifestyle advice □ Follow-up according to national standard DM2, CVRM, Obesitas, Quit smoking, LTA chronic kidney damage □ When accessible, use NVAB 'Healthy nutrition and exercising in the workplace' guideline[51]

Discussion

In this study we described the development and content of a job-specific WHS for hospital physicians and medical residents. Information regarding occupational exposures, job demands, work-related health effects and job requirements was used to follow a step-wise decision process aimed at deciding which job-specific aspects should be included in the WHS. By taking this approach, the ILO guidelines were followed to ensure that the WHS was based on occupational exposures, job demands and job requirements of the job at hand.[12] Such a job-specific approach of a WHS is widely advocated above a general approach because it enables interventions that best fit the occupation of interest and is therefore most likely to increase the effectiveness of the interventions. However, the process of arriving at a job-specific WHS in this way is not widely spread or known and has not been described in the international literature. Therefore, the step-wise procedure described in this study sheds an important light on how to decide on the content of a job-specific WHS and might therefore serve as a good example for developing a WHS in other (high-demand) jobs.

As a consequence of the lack of clear descriptions of how to arrive at the content of a job-specific WHS, some of the decisions made in the step-wise procedure are expert-based and lack an evidence-based foundation. Our decisions were guided by taking into account the main purposes of the WHS as described in the Dutch guideline[13]: to prevent work-related health complaints and to maintain or improve the health and work ability of hospital physicians. To arrive at these goals, the guideline describes what to consider in each of the different steps in developing a job-specific WHS and therefore served as an aid, although it required us to give the exact interpretation of each of these steps for the specific job of hospital physicians. As an example, it guided our decision to include health effects that might be low in prevalence but high in negative effects on health or work ability in order to prevent diminished work-related health and ensure good work functioning and quality of care.

While most of the previously reported intervention strategies among hospital physicians have focused on treatment or counselling of hospital physicians or other healthcare workers when they have been reported sick[52,53], the job-specific WHS developed in this study can serve as a periodic preventive measure for early detection of work-related health effects. In the present hospital settings, the professionals do not adopt a preventive attitude and show a lack of confidentiality, leading to avoidant help-seeking behaviour and self-diagnosis and self-treatment[54,55], which means that taking a preventive approach is rather new and might be an effective measure to decrease the number of hospital physicians that continue to work while sick.[56]

The quality of work of a hospital physician can be negatively impacted by a reduced health status and can thereby threaten patient safety.[10] For example, the quality of patient interactions is reduced and the risk of making errors is increased when a psychological health complaint is present.[57-59] Although the main focus of the WHS is usually on the prevention of the negative health effects that can occur due to job demands and occupational exposures of a specific job[12], the negative effects of dimin-

ished health on quality of work seem equally important because it might impose risk on others, i.e. patients. Therefore, the job-specific WHS also offers a strategy to maintain or improve quality of care and help secure patient safety.

Although the developed job-specific WHS might contribute to maintaining or improving the health of hospital physicians and subsequently act as an aid in maintaining high quality of care, its efficacy and effectiveness needs to be investigated. However, before doing that, it is recommended to focus on potential programme failure first and to investigate whether this job-specific WHS for hospital physicians can actually be implemented in practice.[60] One important aspect of effective implementation is that the target population, i.e. hospital physicians, acknowledges the needs and potential benefits of the programme for their own health and work functioning.[60,61] The job-specific approach in developing this WHS by investigating specific job demands, job requirements and negative health effects helps address this important aspect. In addition to addressing the needs of the target population, it is important to understand the perspectives of all the different stakeholders involved[60,62]: the board of the hospital, the physician's board, the medical managers of each medical specialty, the occupational health services and the occupational physician. This is necessary to arrive at the optimal means of communication and organisation that will influence the feasibility and acceptability of the intervention.[62]

In conclusion, describing the process of developing a job-specific WHS for hospital physicians as well as the final content can serve as an example in taking a more job-specific approach in preventing work-related health and work-functioning problems in other (high-demand) jobs. Due to the job-specific nature, the WHS for hospital physicians can contribute to maintaining good quality of care and securing patient safety by taking care of the care giver.

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APPENDIX CHAPTER 4

Results of an international literature review

In: Ruitenburg MM, Plat MJ, Frings-Dresen MHW, Sluiter JK.
Gezond blijven werken voor medisch specialisten (in opleiding):
ontwikkeling en pilot-implementatie van een PMO.
Amsterdam, Coronel Institute of Occupational Health
report no. 12-01, 2012

The appendix of Chapter 4 presents an overview of the results of an international literature review on occupational exposures of hospital physicians. The methodological quality rating of the articles is first presented (table 1), followed by an overview of the results for each type of occupational demand (table 2). Exposures that exceed safety guidelines or health requirements (referring to figure 1, question 1 of Chapter 4) or emotionally demanding situations with a prevalence of 10% or higher (referring to figure 1, question 1PsEx of Chapter 4) are marked (using *). The data are obtained from the original report describing the development and pilot-implementation of the job-specific WHS for hospital physicians.

TABLE 1 Methodological quality rating articles

Physical biomechanical exposures			
Study	*Study sample*	*Exposure measurement*	*Exposure presentation*
Parshuram 2004	+	+	+
Atkinson 2005	+	+	+
Conzett 2009	+	+	+
Berguer 1999	-	+	+
Berguer 2001	-	+	-
Smith 2003	-	+	+
Vereczkei 2004	+	+	+
Esser 2007	+	+	+
Nguyen 2001	+	+	+
Bergovec 2007	+	+	-
Brown 2004	-	+	+
Mache 2009	+	+	+
Mache 2009	+	+	+
Edwards 2009	+	+	+
Reimann 2009	+	-	-
Psychological/psychosocial exposures			
Zhu 2008	+	+	+
Parshuram 2004	+	+	+
Cao 2008	+	+	+
Mache 2009	+	+	+
Edwards 2009	+	+	+
Arnetz 2001	-	-	+
Lindfors 2009	+	-	+
Chokshi 2009	+	-	+

Continuing for psychological/psychosocial exposures			
Study	*Study sample*	*Exposure measurement*	*Exposure presentation*
Carneiro 2009	+	-	+
Arora 2009	+	-	+
Zahid 1999	-	+	+
Judy 2009	+	-	+
Biological exposures			
Nogler 2001	-	+	+
Lee 1999	-	-	+
Phillips 2007	+	-	+
Nagao 2009	+	-	+
Chemical exposures			
Weisner 2001	+	+	+
Raj 2003	+	+	+
Gentili 2004	+	+	+
Weston 2009	+	+	+
Physical exposures: noise, radiation, electrical fields			
Tsiou 2008	+	+	+
Church 2008	+	+	+
Komiya 2008	+	+	+
Mroz 2008	+	+	+
Pei ho 2007	+	+	+
Tijunelis 2005	+	+	+
Oonsiri 2007	+	+	+
Nejc 2006a	+	+	+
Nejc 2006b	+	+	+
Radhi 2006	+	+	+
Haque 2006	+	+	+
Tasbas 2003	+	+	+
Delichas 2003	+	+	+
Lipsitz 2000	+	+	+
Lee 2003	-	+	+
Botwin 2001	+	+	+
Anderson 1999	+	+	+
Rampersaud 2000	-	+	+

Continuing for physical exposures

Study	*Study sample*	*Exposure measurement*	*Exposure presentation*
Wang 2008	-	+	+
Mahaisavariya 2005	-	+	+
Madan 2002	-	+	+
Muzaffar 2005	-	+	+
Oddy 2006	+	+	+
Hartstall 2005	+	+	+
Macle 2003	-	+	+
Vano 1998	+	+	+
Risse 2001	+	+	+
Chruscielewski 2002	-	+	+
Schultz 2003	-	+	+
Blattert 2004	-	+	+
Ismail 2005	-	+	+
Hafez 2005	+	+	+
Li 2007	-	+	+
Vano 2008	-	+	+
Zakeri 2008	+	+	+
Prlic 2008	+	+	+
Chida 2008	+	+	+
Lie 2008	+	+	+
Wu 2008	-	+	+
Mesbahi 2008	-	+	+
Povoski 2008	-	+	+
Safak 2009	+	+	+
Schiefer 2009	+	+	+
Ismail 2009	-	+	+
Marque 2009	+	+	+
Andreassi 2009	+	+	+
Moncosu 2009	+	+	+
Hausler 2009	+	+	+
Venneri 2009	+	+	+
Kuipers 2009	+	+	+
Bor 2009	+	+	+

TABLE 2 Results per type of demand of hospital physicians

Physical biomechanical exposures				
Type of exposure	*Specialism*	*Measurement method*	*Exposure*	*Study reference*
Walking	Critical care	Direct measurement	M: 6.3km per shift (R: 2-11.3)	Parshuram 2004
	Emergency	Direct measurement	M: 3.8-6.9km per shift	Atkinson 2005
	Gastroenterology	Observation	M: 44min 20s per day (sd: 12min 56s)	Mache 2009
	Internal medicine	Direct measurement	M: 2.1km on Thursday (sd: 0.9)	Conzett 2009
	Internal medicine	Direct measurement	M: 2.6km on Friday (sd: 0.9)	Conzett 2009
	Pediatrics	Observation	M: 44min 22s per day	Mache 2009
Shoulder flexion	Operating room	Observation	M: 9-13mvt per hour	Nguyen 2001
Shoulder abduction	Operating room	Observation	M: 14-15mvt per hour	Nguyen 2001
Shoulder rotation	Operating room	Observation	M: 5-15mvt per hour	Nguyen 2001
Arm rotation	Surgery	Direct measurement	R: -19°-30°	Smith 2003
Arm flexion	Orthopedic	Observation	M: ≥20°	Esser 2007
Arm abduction	Orthopedic	Observation	M: 15°-≥45°	Esser 2007
Elbow flexion	Operating room	Observation	<90°: M: 5-15mvt per hour	Nguyen 2001
	Operating room	Observation	>90°: M: 5-12mvt per hour	Nguyen 2001
Wrist flexion	Orthopedic Operating	Observation	M: 15°-85°	Esser 2007
	room	Observation	M: 3-7mvt per hour	Nguyen 2001
Back flexion	Orthopedic	Observation	M: >20°	Esser 2007
Back/trunk flexion	Orthopedic Operating	Observation	M: 0°-20°	Esser 2007
	room	Observation	M: 4-10mvt per hour	Nguyen 2001
Trunk extension	Surgery	Observation	M: 0.6°-2°	Vereczkei 2004
Trunk rotation	Surgery	Observation	M: 9°-44°	Vereczkei 2004

M, mean; Md, median; IQR, inter quartile range; R, range; sd, standard deviation; %, percentage; h, hour; x, times; mvt, movement; CFU, colony forming units; ppm, parts per million; ppb, parts per billion; dB, decibel; mREM, Roentgen equivalent man; Gy, Gray; V, volts; Sv, Sievert;

Continuing for physical biomechanical exposures

Type of exposure	*Specialism*	*Measurement method*	*Exposure*	*Study reference*
Neck flexion	Orthopedic	Observation	M: >20°	Esser 2007
	Operating room	Observation	M: 10-19mvt per hour	Nguyen 2001
Cervical flexion	Orthopedic	Observation	M: >30°	Esser 2007
Head extension	Surgery department	Observation	M: -25°-1°	Vereczkei 2004
Head rotation	Surgery department	Observation	M: -13°-35°	Vereczkei 2004
Energetic load	Orthopaedic unit	Direct measurement	M: 84-106bpm (R: 75-114)	Bergovec 2007

Psychological/psychosocial exposures

Type of exposure	*Specialism*	*Measurement method*	*Exposure*	*Study reference*
Interruption	Critical care	Self-report	M: 41 x per shift (R: 11-87)	Parshuram 2004
	Emergency room	Observation Observation	22% of workday; M: 1min per interruption	Edwards 2009
	Gastroenterology	Observation	M: 22 x per workday (sd: 8.1)	Mache 2009
	Pediatrics	Observation	M: 24 x per workday (sd: 8.1)	Mache 2009
	Surgery		M: 14 x per shift (sd:3.2)	Mache 2009
Work load	Mixed	Self-report	34-41% never to rarely well-balanced	Arnetz 2001
	Mixed	Self-report	14-69% sometimes to often taxing	Arnetz 2001
	Surgery	Self-report	17.6-26.3% reporting high demands	Carneiro 2009
	Surgery	Self-report	High responsibility	Arora 2009
	Surgery	Self-report	Surgery not according to plan	Arora 2009
Communication	Anesthesia department	Observation	M: 8.9-11.4% of workday	Cao 2008
	Critical care	Observation	M: 1-5.2min per communication	Zhu 2008
	Critical care	Observation	Up to 903 x per 391h	Zhu 2008

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Continuing for psychological/psychosocial exposures

Type of exposure	*Specialism*	*Measurement method*	*Exposure*	*Study reference*
Conflict	Anesthesiology	Self-report	28% often or frequently (with superiors)*	Lindfors 2009
	Anesthesiology	Self-report	24% often or frequently (with co-workers) *	Lindfors 2009
	Anesthesiology	Self-report	48% often or frequently disagree (injustice) *	Lindfors 2009
Aggression	Paediatrics	Self-report	33% (verbal of physical by patient) *	Judy 2009
	Paediatrics	Self-report	32% (during residency training) *	Judy 2009
	Paediatrics	Self-report	9% (physical)	Judy 2009
	Paediatrics	Self-report	68% (> 20 violence per year) *	Zahit 1999
	Paediatrics	Self-report	15% (11 - 19 violence per year) *	Zahit 1999
	Paediatrics	Self-report	40% (6 - 10 violence per year) *	Zahit 1999
	Surgery	Self-report	2% (sexual)	Chokshi 2009
	Surgery	Self-report	14% (malpractice) *	Chokshi 2009

Biological exposures

Type of exposure	*Specialism*	*Measurement method*	*Exposure*	*Study reference*
Blood	Emergency disciplines	Self-report	1 x exposure during training: 24%	Lee 1999
	Emergency disciplines	Self-report	2 x exposure during training: 16%	Lee 1999
	Emergency disciplines	Self-report	3 x exposure during training: 7%	Lee 1999
	Emergency disciplines	Self-report	>3 x exposure during training: 9%	Lee 1999
	Surgery/orthopedics	Self-report	M: 4.2 exposure per year (sd: 4.6/R: 0-17)	Phillips 2007
	Surgery/orthopedics	Self-report	≥ 1 x exposure per year: 65%	Phillips 2007
Staphylococcus Aureus	Anesthesiology	Direct measurement	Upper body: 72 - >100CFU per 16 cm2	Nogler 2001
	Anesthesiology	Direct measurement	Face: 2-3CFU per 16 cm2	Nogler 2001
	Anesthesiology Surgery	Direct measurement	Neck: 12CFU per 16 cm2	Nogler 2001
	Surgery	Direct measurement	Upper body: >100CFU per 16 cm2	Nogler 2001
	Surgery	Direct measurement	Face: >100CFU per 16 cm2	Nogler 2001
		Direct measurement	Neck: >100CFU per 16 cm2	Nogler 2001

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Chemical exposures			
Type of exposure	*Specialism*	*Exposure*	*Study reference*
Isoflurane	Surgery	M: 0.5-2.2* ppm (no scavenging device)	Weisner 2001
	Surgery	M: 0.2-18.6* ppm (scavenging device)	Weisner 2001
Sevoflurane	Anesthesiology	Md baseline oncology: 0.1-28.4* ppm	Raj 2003
	Anesthesiology	Md intra operative oncology : 0.2-2.2* ppm	Raj 2003
	Anesthesiology	Md post operative oncology : 0.1 ppm	Raj 2003
	Anesthesiology	Md baseline dental: 0-17.3* ppm	Raj 2003
	Anesthesiology	Md intra operative dental : 0-6. 5* ppm	Raj 2003
	Anesthesiology	Md post operative dental : 0-5.3* ppm	Raj 2003
	Anesthesiology	Md baseline surgery: 0.1-3.2* ppm	Raj 2003
	Anesthesiology	Md intra operative surgery: 0-5* ppm	Raj 2003
	Anesthesiology	Md post operative surgery: 0.1-1.5 ppm	Raj 2003
	Anesthesiology	Md baseline MRI: 0-0.1 ppm	Raj 2003
	Anesthesiolog	Md intra operative MRI: 0-16.7* ppm	Raj 2003
	Anesthesiology	Md post operative MRI: 0.2-2.6* ppm	Raj 2003
	Anesthesiology	Md (breath): 0.65 ppm (IQR:1.36)	Gentili 2004
	Anesthesiology	Md (urine): 2.1* ppm (IQR:2.6)	Gentili 2004
	Surgery	Md (breath): 0.07 ppm (IQR:0.04)	Gentili 2004
	Surgery	Md (urine): 0.4 ppm (IQR:0.3)	Gentili 2004
Halothane	Enterology	M: 1.6-3.8* ppm (no scavenging device)	Weisner 2001
	Gynecology	M: 0.4-4.7* ppm (no scavenging device)	Weisner 2001
	Ophthalmology	M: 0.2-19.3* ppm (no scavenging device)	Weisner 2001
	Pediatric	M: 10.2-13.5* ppm (no scavenging device)	Weisner 2001
	Surgery	M: 0.6-4.3* ppm (no scavenging device)	Weisner 2001
Nitrous oxide	Anesthesiology	Md baseline oncology: 0-139* ppm	Raj 2003
	Anesthesiology	Md intra operative oncology : 15.5-33* ppm	Raj 2003
	Anesthesiology	Md post operative oncology : 6-21 ppm	Raj 2003
	Anesthesiology	Md baseline dental: 0-43* ppm	Raj 2003
	Anesthesiology	Md intra operative dental : 0-71* ppm	Raj 2003
	Anesthesiology	Md post operative dental : 2-49.5* ppm	Raj 2003
	Anesthesiology	Md baseline surgery: 5-19 ppm	Raj 2003
	Anesthesiology	Md intra operative surgery: 0-107*ppm	Raj 2003
	Anesthesiology	Md post operative surgery: 12-14 ppm	Raj 2003
	Anesthesiology	Md baseline MRI: 0-17 ppm	Raj 2003
	Anesthesiology	Md intra operative MRI: 74.5-153*ppm	Raj 2003
	Anesthesiology Enterology	Md post operative MRI: 12-31* ppm	Raj 2003

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Continuing for chemical exposures

Type of exposure	*Specialism*	*Exposure*	*Study reference*
Continuing for nitrous oxide	Enterology	M: 50* ppm (no scavenging device)	Weisner 2001
	Gynecology	M: 66*ppm (scavenging device)	Weisner 2001
	Ophthalmology	M: 19-147* ppm (no scavenging device)	Weisner 2001
	Ophthalmology	M: 1200* ppm (no scavenging device)	Weisner 2001
	Pediatric	M: 5 ppm (scavenging device)	Weisner 2001
	Surgery	M: 452-2060* ppm (scavenging device)	Weisner 2001
	Surgery	M: 140-3250* ppm (no scavenging device)	Weisner 2001
		M: 37-136* ppm (scavenging device)	Weisner 2001
Benzene	Urology	M: 5 ppb	Weston 2009
Toluene	Urology	M: 5 ppb	Weston 2009
Ethylbenzene	Urology	M: 2 ppb	Weston 2009
Styrene	Urology	M: 2 ppb	Weston 2009
Carbon monoxide	Urology	M: >490* ppm	Weston 2009
Di-t-butylbenzene	Urology	M: 3.2 ppb	Weston 2009
Formaldehyde	Urology	M: 5.8 ppb	Weston 2009
Isooctane	Urology	M: 1.3 ppb	Weston 2009
Xylene	Urology	M: 2 ppb	Weston 2009
Butene	Urology	M: 3.2 ppb	Weston 2009

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Physical exposures: noise, radiation, electrical fields

Type of exposure	*Specialism*	*Exposure*	*Study reference*
Noise	Anesthesiology/Surgery	R pre-surgical: 61-78 dB(A)	Tsiou, 2008
	Anesthesiology/Surgery	R surgical: 57-70 dB(A)	Tsiou, 2008
	Anesthesiology/Surgery	R post-surgical: 61-74 dB(A)	Tsiou, 2008
	Emergency	M: 43-53 dB (Max: 94-117)*	Tijunelis, 2005
Radiation (eyes)	Anesthesiology	M per procedure: 12.55 s / 2.47 mREM	Botwin, 2001
	Cardiology	M: 284-296 µSv (Med: 95-122)	Vano, 1998
	Orthopedic	M: 4.3 min / 0.27 mSv (sd: 0.20)	Mroz, 2008
	Radiology	M: 22 µSv	Hausler, 2009
	Radiology	R: 23-282 µSv	Oonsiri, 2007
	Surgery	M protected: 0.19 mSv per year (R: 0.10-0.33)	Pei Ho, 2007
	Surgery	M per procedure: 3.89 min / 0.09 mSv	Muzaffar, 2005
	Surgery	M: 56.19 min / 2.7 mSv cumulative	Harstall, 2005
	Surgery	M per procedure: 56.19 min / 0.017 mSv	Harstall, 2005
	Surgery	M: 39.4 min per surgery / M: 2.04-7.77 mSv per year	Lipsitz, 2000
	Surgery	M per min: 0.85 µGy	Mesbahi, 2008
	Urology	M per procedure: 26 µGy	Safak, 2009
Radiation (neck/thyroid)	Cardiology	M: 269-325 µSv (Med: 138-214)	Vano, 1998
	Orthopedic	M: 67-148 s per patient / 4.31 mSv per year	Haque, 2006
	Radiology	R protected: 7-318 µSv	Oonsiri, 2007
	Radiology	R unprotected: 1-288 µSv	Oonsiri, 2007
	Surgery	M per patient: 3.6 min / 0.027 mSv	Church, 2008
	Surgery	M unprotected per min: 8.3mrem	Rampersaud, 2000
	Surgery	M: 56.19 min / 7.1 mSv cumulative	Harstall, 2005
	Surgery	M per procedure: 56.19 min / 0.045 mSv	Harstall, 2005
	Surgery	M unprotected: 57 min / 66 µSv	Macle, 2003
Radiation (chest/waist)	Cardiology	M protected: 0.00019-0.000029 mSv	Marque, 2009
	Cardiology	M protected 6 months cumulative: 1.7 mSv	Andreassi, 2009
	Orthopedic	M protected: 4.3 min / <0.01 mSv	Mroz, 2008
	Orthopedic	M unprotected: 4.3 min / 0.25 mSv	Mroz, 2008
	Orthopedic	M: 9.2 min / 0.4 mSv	Ismail, 2005
	Radiology	M: 19.2 min / 3.8 mSv	Ismail, 2005
	Surgery	M protected per min: 0.8 mrem	Rampersaud, 2000
	Surgery	M unprotected per min: 2.2-53.3 mrem	Rampersaud, 2000
	Surgery	M protected: 57 min / 2 µSv	Macle, 2003

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Continuing physical exposures

Type of exposure	*Specialism*	*Exposure*	*Study reference*
Continuing for Radiation (chest/waist)	Surgery	M unprotected: 57 min / 27 µSv	Macle, 2003
	Surgery	M: 39.4 min per surgery / M protected: 0.92-1.64 mSv per year	Lipsitz, 2000
	Surgery	M: 39.4 min per surgery / M unprotected: 5.23-13.77 mSv per year	Lipsitz, 2000
	Urology	M: 0.2 mSv	Ismail, 2005
Radiation (hand/finger)	Anesthesiology	M per procedure: 12.55 s / 4.10 mREM	Botwin, 2001
	Cardiology	M: 260-396 µSv (Med: 120-184)	Vano, 1998
	Radiology	M per procedure: 13.2 min / 0.69-0.84 MGy (sd: 1.08-2.03)	Anderson, 1999
	Radiology	M: 89.4 µSv	Hausler, 2009
	Surgery	M per patient: 3.6 min / 0.023 mSv	Church,2008
	Surgery	M: 0.99 mSv/year (R: 0.10-0.33)	Pei Ho, 2007
	Surgery	Max: 21.8-260 µSv	Nejc, 2006
	Surgery	R per year: 5.44-18.69 mSv	Lipsitz, 2000
	Surgery	M: 0.52-1.61 min / 0.021-0.330 mSv	Madan, 2002
	Surgery	M per procedure: 0.25 mSv	Muzaffar, 2005
	Surgery	M: 56.19 min / 6.7-14.5 mSv cumulative	Harstall, 2005
	Surgery	M per procedure: 56.19 min / 0.043-0.093mSv	Harstall, 2005
	Surgery	M per min: 8036 µGy	Mesbahi, 2008
	Urology	M per procedure: 33-34 µGy	Safak, 2009
Radiation (shoulder/arm)	Cardiology	M: 365-618 µSv (Med: 243-414)	Vano, 1998
	Cardiology	M: 28.7-38.4 µSv (sd: 31.0-44.2)	Marque, 2009
	Orthopedic	M: 0.10-0.75 min / 0.00-0.96 mSv	Oddy, 2006
	Radiology	R shoulder: 19-658 µSv	Oonsiri, 2007
	Radiology	R forearm: 4-1211 µSv	Oonsiri, 2007
	Radiology	M: 0.34 mGy (sd:0.32)	Anderson, 1999
	Surgery	M: 56.19 min / 11.4 mSv cumulative	Harstall, 2005
	Surgery	M per procedure: 56.19 min / 0.073mSv	Harstall, 2005
Electrical field	Anesthesiology	M (30cm): 2.11 mG (sd:1.13)	Lee, 2003
	Anesthesiology	M (50cm): 1.29 mG (sd:0.84)	Lee, 2003
	Anesthesiology	M (83.6cm): 1.00 mG (sd:0.78)	Lee, 2003
	Radiology	M: 9.35-188.88 mV/m	Wang, 2008
	Radiology	M (spinal cord): 18.9-954 mV/m	Li, 2007

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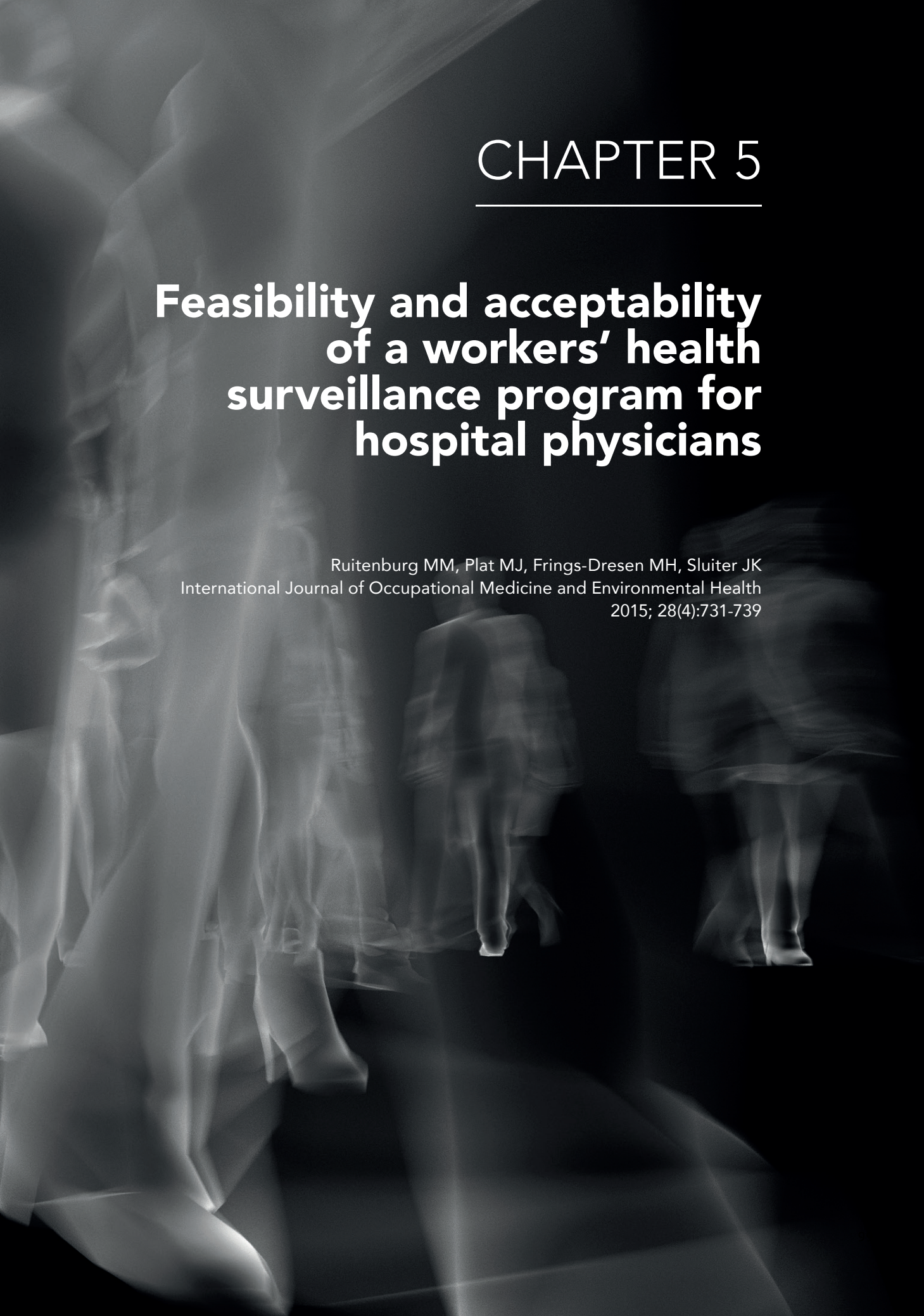
Guidelines chemical exposure	
[1] Nitrous Oxide (N2O)	25 ppm
[2] Nitrous Oxide (N2O)	50 ppm
[1] Isoflurane	2 ppm
[1] Halothane	2 ppm
[2] Halothane	50 ppm
[1] Sevoflurane	2 ppm
[3] Endotoxins	50 EU/m^3
[4] Endotoxins	90 EU/m^3
[2] Benzene	0.5 ppm (TWA) / 2.5 ppm (STEL)
[2] Toluene	20 ppm (TWA)
[5] Toluene	200 ppm (TWA)
[1] Carbon monoxide	35 ppm (TWA)
[2] Carbon monoxide	25 ppm (TWA)
[1] Styrene	50 ppm, 215 mg/m3 (TWA) / 100 ppm, 425 mg/m^3 (STEL)
[2] Styrene	20 ppm (TWA); 40 ppm (STEL)
[1] Xylene	100 ppm, 435 mg/m3 (TWA) / 200 ppm, 868 mg/ m^3 (STEL)
[2] Xylene	100 ppm (435 mg/ m3 (TWA) / 150 ppm (655 mg/ m^3 (STEL)
[5] Formaldehyde	0.75 ppm (TWA) / 2 ppm (STEL)

[1] National Institute of Occupational safety and Health (NIOSH), [2] American Conference of governmental Industrial Hygienists, [3] Heederik 2008, [4] Gezondheidsraad, 2010, [5] OSHA Occupational Health and Safety Administration

1 ppm = 1000 ppb / 1 ppb = 1/1000 ppm

Guidelines physical exposure	
Noise	> 80 db(A)
Heederik, 2008 / European Parliament and Council of the EuropeanUnion, 2003	
Radiation	
[1] Effective dose limits	50 mSv per year
[1] Effective dose limits	Cumulative: 10 mSv x age
[1] Lens of eye	150 mSv (15 rem) per year
[1] Skin, hands and feet	500 mSv (50 rem) per year
[1] Total (whole body) dose	5 rem per year
[2] Total (whole body) dose	2 rem per year
[2] Eye	15 rem per year
[2] Thyroid	30 rem per year
[2] Individual organ	50 rem per year
[2] Skin or extremity	50 rem per year
[1] *National Council on Radiation Protection and Measurements, 1993* [2] *International Commission on Radiological Protection*	
Electrical field	
Brain	20 Hz / 1.77 x 10^{-2} Vm^{-1}
Heart	167 Hz / 0.943 Vm^{-1}
Other tissues	3350 Hz / 2.1 Vm^{-1} / 2100 mVm^{-1}
I*nstitute of Electrical and Electronics Engineers guidance, 2002*	
Magnetic field no exposure limits available	



CHAPTER 5

Feasibility and acceptability of a workers' health surveillance program for hospital physicians

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Abstract

Objectives

A Workers' Health Surveillance (WHS) program is an occupational health strategy used to detect and address the health of individual workers to improve their ability to work. This study aims to investigate the feasibility and acceptability of a new job-specific WHS for hospital physicians.

Material and Methods

All hospital physicians of the general surgery, radiotherapy and obstetrics and gynaecology departments from 1 academic hospital were invited to participate in the WHS by the in-company occupational health service. An occupational physician and a medical assistant were trained to use the protocol. Feasibility was operationalized as the received and delivered dose, observed success factors and potential obstacles. Acceptability was assessed by asking whether the WHS was desirable and feasible for future use and by estimating the effects on health and workability. Written questions and semi-structured interviews were conducted with the participating physicians, 5 department managers and the 2 occupational health professionals involved in the study.

Results

One-third of the hospital physicians (34%) participated in every part of the WHS. The delivered dose was 77/84 (92%). Almost all hospital physicians who received recommendations expected to adhere to this advice. The study participants appreciated the organization of the WHS. This WHS was positively graded (8 out of 10 max) in terms of acceptability. Positive effects of the WHS on health, work functioning and long-term workability were perceived by 2/3 of the physicians.

Conclusions

The new job-specific WHS for hospital physicians showed good feasibility and acceptability among participating hospital physicians, occupational health professionals and medical managers.

Introduction

Hospital physicians are exposed to high physical and psychological work demands that can lead to adverse health effects. For example, they have to adopt and maintain working postures that are perceived as uncomfortable and exhausting[1,2], are confronted with high emotional peak demands[3], and work long hours with little job control.[4,5] Common adverse health effects associated with these job demands include neck, lower back and arm complaints.[2,6,7] Additionally, symptoms of stress, burnout and depression are also present in a considerable proportion of hospital physicians.[8]
The reduced health status of a hospital physician can negatively impact the quality of his work and threaten patient safety.[9] The presence of psychological health complaints is associated with an increased risk of making errors[4,10] and reduced quality of patient interactions.[11] In addition, the presence of physical and psychological health complaints is associated with reduced workability[8], which might lead to long-term sickness absence.[12] To maintain good health and good workability, health surveillance can be used as a preventive measure to reduce the number of health complaints. Health surveillance is an occupational health strategy used to detect, signal and guide diminished health or workability in employees with the goal of preventing work-related diseases and injuries.[13]

A job-specific worker's health surveillance (WHS) for hospital physicians can be used to monitor the work-related health status of physicians and to intervene accordingly to ensure optimal health of hospital physicians and to safeguard patient safety. Based on a thorough investigation of all work-related factors that may affect the health of hospital physicians as suggested by the International Labour Organization (ILO)[13], a job-specific WHS for Dutch hospital physicians was developed.[14] This WHS contains written screening questions, a physical examination and a consult with an occupational physician. The consult includes feedback on the individual outcomes, additional information and advice or an offer of a targeted intervention. The goals of this periodic preventive medical examination are to detect and prevent work-related health complaints in early stages and to improve workability of hospital physicians.[13,15] The content of this WHS is shown in the Appendix at the end of the article.

A feasibility study is recommended before an intervention can be tested for both efficacy and effectiveness.[16] This feasibility study focuses on potential program failure rather than theory failure and produces a set of findings that help determine whether the job-specific WHS for hospital physicians can be implemented in practice. In addition, acceptability, which refers to the opinion of stakeholders with regard to this new strategy, should be investigated.[17] The aim of the present study was to investigate the feasibility and acceptability of a job specific WHS for hospital physicians.

Material and methods

The feasibility study was performed in an academic hospital in The Netherlands. The study consisted of a pilot implementation of the job specific WHS for hospital physicians followed by a process evaluation. All physicians were employees of the hospital.

Participants

Several stakeholders were involved in performing the feasibility study:

- 93 hospital physicians of 3 different medical specialties,
- 5 managers of the surveyed medical specialties,
- 1 occupational physician,
- 1 occupational physician's assistant.

In this manuscript, the term 'participants' refers to the hospital physicians of 3 medical specialties, who participated in the WHS procedure. In addition, the physicians also comprise 1 of the groups of stakeholders that evaluated the WHS as a part of the feasibility study. The 3 medical specialties that voluntarily participated in this study were general surgery, radiotherapy and obstetrics and gynaecology. The pilot implementation consisted of inviting participants with the goal of applying the WHS to approximately 20–40 participants, as per Bowen et al. (2009).[16]

Procedure

After the head of the board of the academic hospital, the physician's board, the workers council, the head of the occupational health service and the medical ethical committee approved the study, the researchers and the managers from each medical specialty separately identified the best means of communication. The eligible physicians (N = 93) received emails and general letters in their individual mailboxes with information about the feasibility study and an informed consent form.

The WHS was organised and executed by the in-house occupational health service (OHS) located in the academic hospital. Beforehand, the researchers, the occupational physician and the occupational physician's assistant identified the optimal way to organise the pilot implementation in the hospital. After establishing the organisation of the pilot implementation, an expert in occupational medicine and the project leader (JS) educated the occupational physician about the protocol and the tasks that he would be responsible for, following the educational strategy proposed by Grol and Wensing (2006)[18], which consists of using case examples. Two researchers (MMR and MJP) taught the physician's assistant how to obtain informed consent and how to perform the physical examination according to the instructions in the test protocol. The participating hospital physicians completed written questionnaires about their health. Additionally, the physicians underwent medical examinations to check their vision and hearing and to obtain measures of cardiovascular risk factors. Finally, the occupational physician gave each participating physician a consultation to provide personalised feedback and guidance. This advice could have been a suggestion to adjust one's lifestyle or a referral to another provider to perform additional examinations or therapy. This guidance could have also been directed to the organisational level, such as the advice to take individual preventive measures at the workplace or in the organisation of one's work. A written form with these recommendations was given to the participants. The occupational physician kept an individual record of each participant that included the individual results and the recommendations that were provided.

Process evaluation

A process evaluation of the WHS took place with all involved stakeholders to investigate the feasibility and acceptability of the WHS. After completing the WHS, the hospital physicians received a written evaluation form. Hospital physicians who decided not to participate in our study had the opportunity to provide their reasons for non-participation on the informed consent form. Semi-structured interviews were held with the occupational physician and his assistant, as well as with the managers of each of the medical specialties that participated in the study. These interviews were held to obtain information regarding the feasibility and acceptability of the job specific WHS for hospital physicians.

Feasibility was defined as the extent to which the job-specific WHS for hospital physicians was implemented as planned and proposed. Feasibility was tested by identifying the received and delivered dose and success factors and potential obstacles. The received dose was operationalised by the number of participants who completed the questionnaire and underwent the medical examination and by the number of participants who visited the occupational physician. To obtain the received dose the ratio between these numbers was calculated. The delivered dose was operationalised as the number of actual interventions that were recommended relative to the number of interventions that could have been recommended based on the individual outcomes. The delivered dose was measured from the records kept by the occupational physician. As another aspect of the delivered dose, the occupational physician and his assistant were asked to what extent they adhered to the protocol. Information regarding the 2nd concept was obtained from the interviews with all the actors involved, the written evaluation forms and the informed consent of hospital physicians who did not participate in the WHS. For both aspects of the delivered dose the ratios between the 2 numbers were calculated. Regarding the success factors and potential obstacles, a descriptive analysis was performed using the semi-structured interviews and the written evaluations.

To assess acceptability, we asked whether a future WHS was considered desirable and feasible by the stakeholders involved in the feasibility study. The hospital physicians answered 3 questions with yes or no responses about their expectations of whether the WHS was able to positively affect their general health, their work functioning and their long-term work ability. In addition, they were asked about their appreciation of the current WHS, their appreciation of being offered a WHS in the future (both rated on an 11-point Likert scale from 0 to 10, with 0 meaning “no appreciation at all” and 10 meaning “very much appreciation”) and whether they intended to participate in a future WHS. The managers of the medical specialties, the occupational physician and the occupational physician’s assistant answered questions about their satisfaction with the WHS and their intentions to participate in and/or facilitate a future WHS. For questions with a yes/no response, the relative frequencies (%) were calculated. A mean value was calculated for items that were scored on an 11-point scale (score: 0–10). In addition, these items were dichotomised, using a cut off score of ≤ 5, according to the Dutch scholar system, to calculate the relative frequency of insufficient scores.

Results

Participants

Three medical specialties participated in the study: general surgery, radiotherapy and obstetrics and gynaecology. A total of 93 hospital physicians were invited, of whom 50 (54%) responded and 35 (38%) agreed to participate. In the end, 32 (34%) hospital physicians completed the WHS, and 30 completed the written evaluation. Therefore, the desired and required number of 20–40 participants was obtained. Table 1 provides an overview of the participants.

TABLE 1 Overview of participating hospital physicians according to specialty

	Specialty of respondents							
	general surgery		*radiotherapy*		*gynaecology and obstetrics*		*Total*	
Respondents	*n*		*n*		*n*		*n*	
Invited to study	22		21		50		93	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Those who completed the WHS	10	(45)	8	(38)	14	(28)	32	(34)
Sex	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Male	8	80	2	25	4	29	14	44
Female	2	20	6	75	10	71	18	56
Occupation								
Medical doctor	9	90	6	75	10	71	25	78
Medical resident	1	10	2	25	4	29	7	22
	Mean	*(SD)*	*Mean*	*(SD)*	*Mean*	*(SD)*	*Mean*	*(SD)*
Age (years)	46.3	8.6	43.6	10.8	40.7	9.4	43.2	9.5

WHS – Workers' Health Surveillance (WHS) program

SD – standard deviation

Process evaluation

With respect to the received dose, 91% (N = 32/35) of the hospital physicians completed the questionnaire and underwent the medical tests. All of these hospital physicians (100%, N = 32/32) visited the occupational physician and received personal feedback based on their results. The delivered dose was 77/84 (92%). In total, the occupational physician did not recommend a suggested intervention 7 out of 84 times. However, an additional recommendation was provided 22 times based on the consult. Examples included educational recommendations about lifestyle and tips and tricks

to prevent needle stick injuries. The total time for each participant to follow the whole procedure was approximately 60 minutes.

The perceived benefits of participating in the WHS were considered to be a factor of success. With respect to reasons for participating (or not) in the WHS and the procedure of the WHS, between 2 and 10 hospital physicians mentioned the following items:

- preventing work-related health complaints and having a check up on their general health were important reasons for participating,
- they doubted the effectiveness of the WHS and were anxious that the WHS would contribute to the medicalization of apparently healthy hospital physicians,
- they appreciated the brief and clear communication of the occupational physician's assistant,
- most items of both the questionnaire and the medical examinations were clear, although a few were unclear.

Almost all hospital physicians who received recommendations for interventions (N = 22/23) felt that they would adhere to this intervention to improve their health.

The occupational physician and the assistant mentioned that the successful results were the result of offering flexible testing and consulting times for the participating physicians. They also stated that the proximity of the occupational health service to the hospital physicians was a success factor. The clear and regular communication between the occupational physician and the assistant was also mentioned as a success. An obstacle was the workload of the physician's assistant. Both the occupational physician and the assistant were satisfied (score 9 on a scale from 0 to 10) with the instructions and the documents they received prior to the WHS. During the WHS, they adjusted the protocol slightly to fit their individual working preferences.

The medical directors were satisfied with the organisation of the WHS. They thought the WHS was well-prepared and that the communication to the hospital physicians was brief and clear. They perceived the WHS to be efficient and appreciated the flexibility of the occupational health service with respect to making appointments.

Most hospital physicians believed that participating in this WHS would positively affect their general health (N = 24/29), work functioning (N = 20/29) and long term work ability (N = 22/29). They appreciated the current WHS, with a mean score of 8 (range: 6–10). Overall, the ability to participate in this WHS in the future was appreciated, with a mean score of 8 (range: 3–10), although 3 hospital physicians did not appreciate this. Almost all hospital physicians (N = 28/30) indicated that they would participate in a WHS when offered in the future. One third of the hospital physicians (38%) preferred to receive recommendations for interventions from the occupational physician, and almost 1/2 (48%) of the physicians preferred online recommendations. Almost all hospital physicians (N = 29/30) were satisfied with the brief and clear communication prior to the WHS. The occupational physician indicated that he would like to continue offering the WHS in the future because he believed that the WHS meets the needs of hospital

physicians. He stressed the importance of a clear internal consensus within the occupational health service about tasks and duties. Both the occupational physician and his assistant suggested offering an online questionnaire. In addition, an online record of results and advised interventions for each hospital physician was recommended to reduce paperwork.

The medical directors of surgery, radiotherapy and obstetrics and gynaecology were satisfied with the brief and clear communication prior to the WHS. They also appreciated the proximity and flexibility of the occupational health service. All medical directors were dubious about offering this WHS in the near future because of the unknown long-term effectiveness of the WHS on work-related health and the workability of hospital physicians. The medical directors suggested maintaining the organisation of the current WHS when offering the WHS in the future. They supported the suggestion to offer an online questionnaire to the participants. To optimise the WHS, they suggested stressing that participation is voluntarily and regularly and repeatedly informing hospital physicians about the option to participate in the WHS.

Discussion

In this study, a new job-specific WHS for hospital physicians was found to be feasible and acceptable. In general, this WHS was well received by all stakeholders involved. The communication from and organisation of the in-house OHS were appreciated. Hospital physicians who received a recommendation expected to adhere to this advice and believed that one's health and workability could be improved by following this advice.

An essential aspect to consider is the desire of the target group of hospital physicians to participate in a WHS. In this study, 1/3 of the invited hospital physicians participated in and completed the WHS, a relatively high number compared to other similar implementation studies.[19] Two-thirds of the hospital physicians anticipated that the WHS would be able to positively affect their general health, work functioning or long term ability to work, suggesting that these perceived benefits were, for most hospital physicians, the main reason to participate. In the future, when implementing the new job specific WHS for physicians in other hospitals, these perceived benefits to the physicians should be emphasised to increase the received dose.

One challenge in implementing a new WHS protocol for occupational health (OH) professionals is that if participants do not embrace medical tests and recommendations, the theoretical maximal effect will never be achieved. The protocol for administering the WHS in this study was described in detail. However, earlier WHS studies in other health care occupations also provided exact descriptions of signals to look for, criteria to use, relevant choices for recommendations and topics to discuss with workers, but these descriptions were not sufficient to effectively guide the OH professionals.[20] Because the current job-specific WHS was executed by in-house occupational health professionals, we educated them about the suggested WHS protocol before the implementation phase. Before the study, it was emphasised that this was an important test of

their ability to follow the protocol. The results of the delivered dose, which reflects the number of interventions that were recommended based on each individual's results, revealed that the occupational health professionals in this study were able to adhere well to the protocol. This is an important finding because the theoretical effect of adhering to the WHS should be maximal to demonstrate the potential effect on worker outcomes.

All stakeholders were satisfied with the communication and organisation of the WHS, which increases the likelihood of future implementation of the WHS. With the exception of offering an online questionnaire, the OH professionals and medical managers suggested maintaining the current organisation of the WHS. An online questionnaire would also decrease the workload of the physician's assistant, because it would reduce the amount of time she spent to administrative tasks. Consultation with all stakeholders about the organisation of the WHS prior to implementation most likely was the main contributor to positive acceptance of the WHS, reinforcing the results of implementation studies that stress the importance of understanding the perspectives of different stakeholders, especially medical managers, who will influence the feasibility and acceptability of an intervention.[16,21] Information about the optimal means of communicating and organising a WHS for physicians should be obtained from medical managers and supervisors.

Physicians can be reluctant to seek access to healthcare services and try to avoid discussing their health with the occupational physician or their general practitioner.[22-24] As observed in this study, they might have doubts about the effectiveness of a WHS or fear medicalization. Strategies for prevention, promotion of health and early identification of diseases among physicians are often lacking in European countries.[25] However, this study revealed that the new job-specific WHS for hospital physicians is a feasible and acceptable occupational health strategy for early detection of work-related health complaints among hospital physicians. One might argue that the effectiveness of the job-specific WHS in reducing work-related health complaints and increasing the ability to work must be tested, but we believe, in line with Bowen et al. (2009)[16], that for an intervention to be worthy of testing for efficacy, it should first be deemed feasible and acceptable.[16]

Conclusions

As we have demonstrated feasibility and acceptability, we recommend that the WHS be implemented as an occupational health strategy with the aim of reducing work-related health complaints and improving the workability of hospital physicians. Future evaluations will be needed to demonstrate these effects.

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Appendix

Overview of the concepts of the job-specific Workers' Health Surveillance for hospital physicians and the way they were addressed

Parameter	Concept
Health effects	
physical health effects	
musculoskeletal complaints and perceived work-related restrictions in neck, shoulder, back and hand/wrist region	written questions (yes/no)
psychological health effects	
posttraumatic stress complaints	Impact of Events Scale[26]
psychological health complaints	Brief Symptom Inventory (BSI)[27] scale depression and anxiety
Health requirements	
recent exposure to	
aggression and violence in work by (family of) patients and colleagues	written questions (yes/no)
traumatic experiences	written question (yes/no)
stick- or needle injuries	written question (yes/no)
infections	written question (yes/no)
exposure of airways / lungs to dust, smoke, gas or vapour	written question (yes/no)
exposure of the skin to solid and liquid substances	written question (yes/no)
Wakefulness	
drug use	written questions
alcohol use	AUDIT-C[28]
work-related fatigue	QEEW scale work related fatigue[29]
sleepiness	Epworth Sleepiness Scale[30]
sight in relation to function	written question (yes/no) + Landolt-C ring test
hearing in relation to function	written question + whisper test
Work ability	
general current work ability (scale 0–10)	written question
self-reported other work-related health complaints	written question
Risk factors cardiovascular diseases (CVD)	
smoking / family history CVD / diabetics	written question (yes/no)
body mass index / blood pressure / waist circumference	biometric examination

CHAPTER 6

Current and future health care needs of future hospital physicians

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Abstract

Background
Work-related health problems can impair the work ability of hospital physicians and pose a threat to patient safety. Understanding the health status and care needs of young hospital physicians is therefore essential to providing job-specific health services and ensuring good future quality of care.

Aims
To investigate the current health status of future hospital physicians and their current and future care needs and to explore their preferences regarding occupational health services.

Methods
We gathered data concerning worries about current health, current and future care needs and preferred ways of receiving feedback and interventions when using occupational health services from the 2013 wave of a cohort study of Dutch medical students (original population: n=4,961). We also calculated the relationship between current health status and future care needs.

Results
We obtained data from 647 future physicians. Irrespective of their stage of training, most (73%) had few worries about their current health. However, two fifths felt in need of care for psychological (42%) or physical (40%) complaints. More than half (52%) anticipated future care needs by indicating they would consider using occupational health services when offered in the future. General health status was not significantly related to feeling in need of future care. Preferences regarding feedback on health results were to receive this by email (54%) or from an occupational physician (51%) and in their own teaching hospital (68%).

Conclusions
Future hospital physicians expressed a need for current and future occupational health care, irrespective of current worries about health.

Introduction

Hospital physicians experience negative work-related health effects. These may include physical neck, lower back and arm complaints that have been reported frequently[1-3], or symptoms of stress, burnout and depression found in a considerable proportion of hospital physicians.[4] Such health complaints can have negative effects on the work-related health status of doctors and consequently on their work ability[4], which may reduce the quality of healthcare and put patient safety unnecessarily at risk.[5]

It is known that hospital physicians tend to delay seeking help and do so less than other groups.[6] As a result they continue working despite reduced work ability. They may avoid seeking help due to a perceived lack of confidentiality or a lack of easily accessible healthcare services in favour of self-diagnosis and self-treatment.[7,8] Despite this avoidant help-seeking behaviour, the negative work-related health effects seem to indicate a clear need for guidance for hospital physicians on both their physical and psychological health.

To ensure the future good health of hospital physicians and a resulting high quality of care, it is necessary to consider the health status and occupational care needs of future hospital physicians. In this study we distinguish three groups of future hospital physicians who are at different stages of training: i) medical students; ii) medical students who are clinically active; and iii) hospital physicians who have just graduated. Work-related health impairment due to psychological complaints such as depression (35-41%), anxiety (28-32%) or stress (18-22%) has been reported previously among medical students.[9,10] However, it is as yet not known whether medical students worry about their current health status or whether they currently feel the need for care for psychological or physical complaints. Understanding worries about their current health status and care needs is necessary to determine whether medical students and young hospital physicians actually feel the need to improve their health in order to increase their work ability and quality of care.

During a working career, worker's health surveillance (WHS) is one of several programmes in the Netherlands implemented to improve or maintain good work-related health through treating or preventing work-related health complaints.[11,12] However knowing that a culture of self-prescription and self-treatment among hospital physicians seems to be acquired at medical school[13], the question is whether medical students and young hospital physicians actually anticipate future care needs. Insight into these future care needs is relevant if we want to determine whether a WHS could be an appropriate intervention during the working life of doctors for preventing and treating work-related health complaints.

In order to meet care needs and increase the likelihood of hospital physicians seeking treatment for work-related health complaints healthcare services must be easily accessible. Understanding the way future hospital physicians would like to receive care would be useful in this respect. In addition, the attitude of future hospital physicians towards the impact of health problems on work ability and quality of care is likely to be important in determining whether they will seek treatment for such problems. Investigating how anticipated future care needs relate to experiencing current health problems will also provide insights into the way future hospital physicians believe health problems can affect their work ability and quality of care.

Therefore to ensure good future quality of care and patient safety, it seems sensible to focus on maintaining good work-related health in future hospital physicians. This study therefore investigated four questions: i) Do future hospital physicians worry about their current health?; ii) What are the current and future care needs of future hospital physicians?; iii) Are worries about their current health related to anticipating future care needs?; and iv) What are the preferred ways in which future hospital physicians would like to receive advice and support to maintain good work-related health?

Methods

This study used cross-sectional data from the third wave of a cohort study of medical students in the Netherlands. The original study population consisted of 4,961 medical students. The third wave study population consisted of medical students from years three to six and of graduated hospital physicians from two (out of eight) medical schools in the Netherlands. At these two medical schools the basic educational medical programme lasts six years and consists of four years of theoretical education, followed by two years of practical experience in the form of hospital internships.

Study subjects (n=892) were asked to fill in an electronic survey voluntarily. Confidentiality was maintained by linking personal data to a personal login code. Reminders were sent twice. The study was carried out in accordance with the Declaration of Helsinki (2008), and approval was given by the Medical Ethical Committee of the Academic Medical Centre (Amsterdam).

Responding study subjects were divided into three groups based on the different stages of their medical careers: i) students in their third or fourth year (medical students); ii) students in their fifth or sixth year doing an internship (clinically active students); and iii) graduated students (graduated hospital physicians). Worries about health were determined by asking subjects to indicate on a 0-100 VAS scale to what extent they worried about their current health (0 = not at all, 100 = a lot). The current care needs of our study population were defined by the question: Do you feel the need for counselling, coaching or treatment of psychological or physical complaints? (Possible answers: 'yes' or 'no'). Future care needs were defined by the question: Would you consider using a job-specific WHS if this were offered by your employer? (Possible answers: 'yes', 'no' or 'that depends'; multiple answers were permitted). Respondents were also invited to explain their answers. Specific questions regarding future WHS needs were added in this wave of the cohort study: subjects were asked how and where they would like to receive feedback (Options: online, by email, by phone, by an occupational physician, by a medical specialist, or by some other channel) and where they would prefer any interventions to take place (Options: in their own teaching hospital, in another hospital, in a separate clinic, by internet, by email, by phone, at a professional's home or some other channel). Multiple answers were permitted. All questions used were specifically designed for this study population.

For each of the three groups, the number and percentage of respondents and their age in 2013 (mean and SD) were reported. In relation to current worries about health, subjects were divided into three groups: hardly any worries (scores 0-33), some worries (34-67) and a lot of worries (68-100). For each of these groups, the number and percentage for each population was calculated. For data regarding current care needs, the number and percentage of respondents reporting physical and psychological complaints were calculated and described for each population group. For the future care needs a dichotomous (yes/no) variable was created. Respondents who answered 'that depends' were removed from these data. We acknowledge that this is a partial analysis of the data in which we compare results for those responding 'yes' and 'no', excluding those responding 'that depends' from consideration. For each population group, the number and percentage of respondents answering yes or no were determined. To investigate whether having worries about current health was related to anticipating future care needs, a bivariate correlation was performed and tested for significance using Kendall's Tau-Beta. For data regarding how and where respondents would like feedback on their WHS results, the number and percentage for each answer category were calculated for each population group.

Results

Complete data on 647 respondents (66% of those surveyed) were available for analysis. We did not have information on non-responders in order to assess response bias. The majority of respondents were medical students (48%) in their third or fourth year of medical school, while the number of graduated hospital physicians was relatively low (12%) (see Table 1).

In relation to the first research question the majority of respondents within each subgroup reported few worries about their health. Data suggested that the number of young hospital physicians worrying about their health decreased as their medical career advanced.

TABLE 1 Respondents' characteristics and worries about current health

	Medical student		**Clinically active student**		**Graduated hospital physician**		**Total**	
	n	(%)	n	(%)	n	(%)	n	(%)
Number (and %) of total population	301	(48)	253	(40)	76	(12)	647	(100)
	Mean	*(SD)*	*Mean*	*(SD)*	*Mean*	*(SD)*		
Age	25	(2.2)	27	(2.2)	28	(2.1)		
	n	(%)	n	(%)	n	(%)	n	(%)
Few worries	192	(69)	176	(75)	58	(81)	426	(73)
Some worries	62	(22)	45	(19)	11	(15)	118	(20)
A lot of worries	25	(9)	13	(6)	3	(4)	41	(7)

Although relatively few future hospital physicians (27%) expressed some or many worries about their current health status, a larger proportion indicated having current care needs for psychological (42%) or physical (40%) complaints (see Table 2). A trend seemed apparent in that care needs, both current and future, decreased as young hospital physicians progressed through the stages of becoming a hospital physician.

TABLE 2 Respondents' current and anticipated future care needs

	Medical student (n=298)		**Clinically active student** (n=247-251)		**Graduated hospital physician** (n=76)		**Total** (n=621-625)	
Current care needs	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*
Psychological complaints	132	(44)	106	(42)	26	(34)	264	(42)
Physical complaints	142	(48)	87	(35)	19	(25)	248	(40)
Future care needs	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*
Workers' health surveillance: yes	169	(57)	123	(50)	32	(42)	326	(52)
Workers' health surveillance: no	30	(10)	28	(11)	13	(17)	73	(12)

More than half of respondents (52%) indicated that they would consider addressing their care needs if a future WHS were to be offered, while again a trend seemed apparent in that these anticipated future care needs decreased as young hospital physicians advanced in their career. The main reasons for considering using a WHS in the future were that it would contribute to their own safety and patient safety, to the quality of their own work and to improving or maintaining their good health. A fourth reason was the feeling that it can do no harm.

A minority of the medical students (10%) and clinically active students (11%), and one in six of graduated hospital physicians (17%) said they would not consider using a WHS if offered to them in the future. They explained that their health status was their own responsibility and they would only need healthcare services if they started experiencing health complaints. Concerns regarding the consequences for their employment or for their own health status if participating in a WHS were also offered as arguments for not considering using one.

With respect to our third research question there seemed to be no significant association among young hospital physicians between having worries about their current health and their anticipated future healthcare needs (τ= -.06, p>0.05) (see table 3). Despite having few worries about their current health status 82% of future hospital physicians said they would consider taking part in a WHS in the future.

TABLE 3 Relation between current worries about health and wish to participate in a WHS

	Worker's Health Surveillance: yes		Worker's Health Surveillance: no	
	n	*(%)*	*n*	*(%)*
Few worries (n=266)	219	(82)	47	(18)
Worries (n=81)	69	(85)	12	(15)
A lot of worries (n=32)	25	(78)	7	(22)

The fourth research question focussed on the preferred ways in which future hospital physicians would like to use a WHS if offered to them (see table 4). Their preferred ways to receive feedback about their work-related health were by email (54%) or through a face-to-face feedback consultation with an occupational physician (51%). Receiving feedback by phone was the least preferred way (16%).

The majority of participants said they would like any interventions necessary to improve their work-related health to take place at their own teaching hospital (68%). A third of participants (34%) viewed a professional's practice outside the hospital as a suitable place to receive advice or interventions. There appear to be no differences between the three study groups regarding either preferred ways to receive feedback on their work-related health or preferred locations for receiving interventions or getting advice.

TABLE 4 Preferred means of feedback on WHS results and preferred locations for health interventions and advice (in both cases more than one option can be selected).

	Medical student (n=279)		Clinically active student (n=234)		Graduated hospital physician (n=72)		Total (n=585)	
Mode of feedback:	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*
Online	75	(25)	69	(28)	25	(33)	169	(27)
By email	163	(55)	128	(52)	42	(55)	333	(54)
By phone	47	(16)	40	(16)	9	(12)	96	(16)
Occupational physician	151	(51)	117	(47)	49	(65)	317	(51)
Medical specialist	88	(30)	57	(23)	24	(24)	169	(27)
Guidance at/by:								
Own teaching hospital	220	(74)	153	(62)	51	(67)	424	(68)
Other hospital	71	(24)	65	(26)	13	(17)	149	(24)
Separate clinic	47	(16)	30	(12)	11	(15)	88	(14)
Internet	83	(28)	58	(24)	19	(25)	160	(26)
email	79	(27)	53	(22)	20	(26)	152	(25)
Phone	40	(13)	31	(13)	10	(13)	81	(13)
At professional's home	94	(32)	88	(36)	28	(37)	210	(34)

Discussion

This study found that the majority of medical students and young hospital physicians reported having current healthcare needs and anticipating having such needs in future. This indicates that, despite the lack of help-seeking behaviour in hospital physicians, probably due to the tendency to engage in self-diagnosis or self-treatment[7,8], there is a clear need for prevention and treatment of work-related health complaints among future hospital physicians.

Regarding the first research question, it is evident that the majority of future hospital physicians had few worries about their current general health, although around 40% reported that they currently needed healthcare for either physical or psychological complaints. Responding to the second research question, on future healthcare needs, more than half said they would consider using occupational health services, if offered, to maintain or improve good work-related health. With respect to the third research question, the number of current worries about health was not significantly related to anticipating future care needs. Despite having few worries regarding their current health, young hospital physicians would consider participating in a WHS if this were offered. In answer to our fourth research question, the majority of future hospital physicians expressed a wish to receive feedback on their health status by email or through direct contact with an occupational physician, and the majority preferred to receive this feedback in their own teaching hospital.

A particular strength of our study is the number of future hospital physicians that participated. However the study sample was drawn from the two largest of the eight medical schools in the Netherlands. Although we did not find any differences between these two medical schools in the variables measured at baseline[14,15], and Dutch medical students are nationally divided between medical schools, this and the response rate compared to the original study population might raise some concerns about drawing conclusions for the whole population of Dutch medical students and young hospital physicians. The information gathered about WHS was only included in this third wave of the cohort study. It should be noted that we did not sample information about non-responders, although this study focussed on differences between subgroups of responders within the third wave of a cohort study. We do know that 329 email addresses were not active anymore and were probably ex-students that did not reveal their new email address to the research team.

What could be regarded as a limitation, but we consider to be a strength, is that the questions asked were not standardised questions but were specifically designed for this study population. Although using these questions might limit comparison with other studies, there was a reason for doing so. Despite the guidelines of the International Labour Organization (ILO) on the procedure and content of a WHS[11], adjustments based on special populations or environmental conditions are likely to be necessary to meet the preferences of the target population.[12] This seems particularly important when it comes to issues of confidentiality.

Whereas issues of confidentiality might prevent hospital physicians from participating[7,] this does not seem to be an issue in our population of future hospital physicians. The majority said they would consider participating in a WHS if this were to be offered in the future and would like to receive feedback on their results from an occupational physician or by email and to get advice or receive interventions in their own teaching hospital. Participants were well informed about the content and procedure of a job-specific WHS before the questions were posed, a strength of this study which may have contributed to these findings. Providing information to hospital physicians about the content and procedure of the WHS might help them overcome potential anxieties that keep them from monitoring their work-related health status.

This study revealed a clear need for care among future hospital physicians in respect of both their current and future work-related health. Interestingly, the training stage of the study subjects affected neither their perceived current healthcare needs nor their anticipated future needs. Furthermore, although the majority of medical students and young hospital physicians did not report worries about their current health, a number reported a current need for counselling or treatment for physical or psychological problems, in line with previous studies reporting psychological complaints such as depression and burnout among medical students.[9,10] This seemingly contradictory discrepancy between reporting care needs for health complaints and not reporting worries regarding health is likely to reflect a significant difference between experiencing health complaints or healthcare needs on the one hand and actually worrying about them and their potential negative consequences on the other. This might be explained both by a tendency of existing and future hospital physicians to neglect their own symptoms[6] and also by a lack of awareness among them about the potential threat of impaired health to the quality of care and patient safety. This was also considered to be the reason why physicians comply less well with hygiene measures than nurses[16], and suggests that educating medical students about the potential negative effects of impaired health is important, as is informing them about occupational health services in order to encourage them to improve their health. Such education might contribute to changing the avoidant help-seeking behaviour that is thought to be acquired at medical school.[13]

In conclusion, this study suggests that preventive healthcare measures are needed in this highly educated group of workers that should know what aspects contribute to diminished health. The job-specific WHS is a preventive measure that would be valued and used by the majority of participants. Therefore we believe that providing a job-specific WHS is an appropriate way to maintain or improve the good health of hospital physicians during their medical careers. Our findings support the belief that a job-specific WHS that meets the preferences of the target population is a suitable instrument to maintain or improve the work-related health status of hospital physicians. A job-specific WHS should be based on a thorough investigation of all work-related factors that can affect the health of hospital physicians, and should contain screening questions and physical examinations.[11] There is a need to provide more information about the potential negative effects of impaired health on the quality of medical care and on patient safety, as well as information about the content and procedure of a job-specific WHS for hospital physicians.[17]

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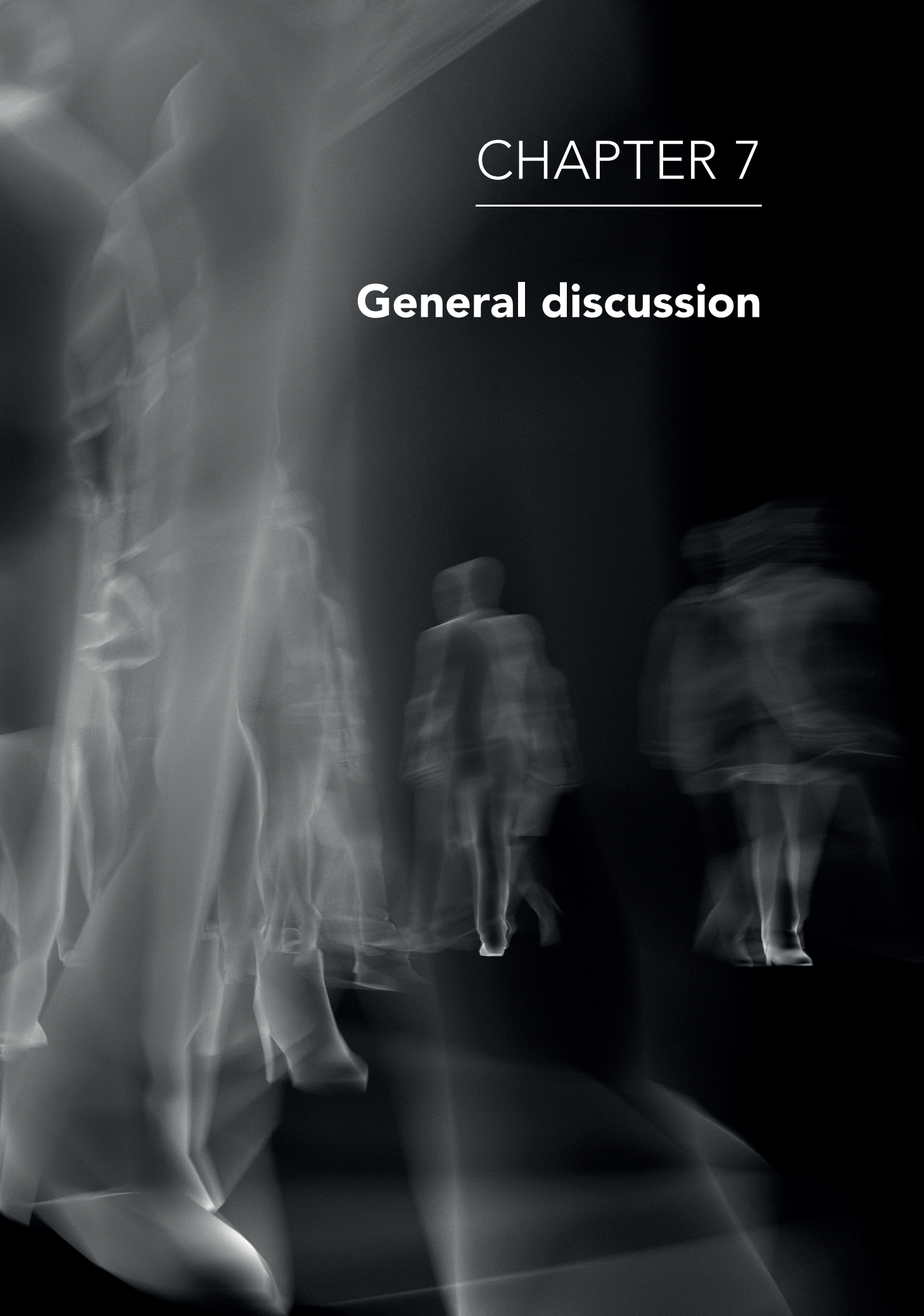

CHAPTER 7

General discussion

General Discussion

This thesis focusses on the development and implementation of a job-specific workers' health surveillance (WHS) for hospital physicians (medical specialists and medical residents). Its objectives were to provide an evidence base for a job-specific WHS for hospital physicians and to evaluate whether this job-specific WHS is feasible and acceptable.

The following research questions were formulated:

1. What are the occupational demands and work-related health effects, and resulting work functioning effects of hospital physicians?
2. What are the steps necessary to create the content of the job-specific WHS?
3. Is the new job-specific WHS feasible and acceptable?
4. What are the care needs of future hospital physicians?

In this chapter, the main findings are presented, followed by methodological considerations and the implications of findings. Finally, recommendations for research and practice are made.

Main findings

1. What are the occupational demands and work-related health effects, and resulting work functioning effects of hospital physicians?
Findings from the self-report questionnaires, systematic observations at the workplace and a systematic literature review provide an evidence base for the occupational demands, work-related health effects, and resulting work functioning effects of hospital physicians (as described in Chapter 2, Chapter 3 and in the Appendix of Chapter 4). Hazardous occupational demands of hospital physicians include physical work demands, psychosocial work demands, exposure to biological and chemical substances, exposure to emotionally demanding situations, and exposure to noise and radiation. Hospital physicians experience physical health complaints, mainly in the upper extremity region, of which a considerable proportion is framed as being work-related and is said to impair their work functioning. Psychological health complaints are also prevalent among hospital physicians with prevalence rates varying from 6% for burnout to 42% for work-related fatigue. Hospital physicians with psychological health complaints may be affected in their work functioning as it increases the odds of reporting insufficient work ability.

2. What are the steps necessary to create the content of the job-specific WHS?
After having provided an evidence base for the hazardous occupational demands, work-related health effects, and resulting work functioning effects of hospital physicians, the following step consisted of developing decision trees for the different types of occupational demands to establish whether the related health effects should be considered for inclusion in the WHS (Chapter 4). In the next step, a-priori decision

rules were followed that took into account the prevalence and impact of the health- or work functioning effect. The prevalence of emotionally demanding situations was also included. To complete the content of the job-specific WHS, targeted advice and/or interventions were selected from guidelines and literature.

The final content of the job-specific WHS for hospital physicians consists of the assessment of the following physical and psychological requirements: no impairments due to musculoskeletal disorders, sufficient vision, sufficient hearing, recent exposure to hazardous substances (with effects on skin or respiratory tract), recent exposure to bodily material of patients to check taken procedures, alertness and judging ability (which includes recent exposure to emotionally demanding situations (like violence or abusive behaviour), psychological health complaints, drug use, alcohol consumption, sleepiness and work-related fatigue), self-reported work ability, and risk for cardiovascular diseases.

3. Is the new job-specific WHS feasible and acceptable?
The findings of the pilot implementation of the WHS among hospital physicians of three medical specialties and the process evaluation with all stakeholders involved indicated that the new job-specific WHS for hospital physicians is feasible and acceptable. The hospital physicians of three different medical specialties have participated in the study and medical directors have indicated being satisfied with the organisation and communication of the WHS. In addition, a considerable proportion of the hospital physicians of these medical specialties followed the WHS. Almost all of the participating hospital physicians reported appreciating the organisation of the WHS and perceives the WHS to be beneficial for their own health, work functioning and long-term work ability. Finally, the occupational health service was able to deliver the WHS as it was planned and proposed.

4. What are the care needs of future hospital physicians?
Current and future care needs have been assessed for three groups of future hospital physicians: medical students, medical students who are clinically active, and recently graduated hospital physicians. Despite the fact that relatively few future hospital physicians express having serious worries about their current health status, a larger proportion expressed that they currently need care for their own psychological or physical health problems. The majority of future hospital physicians indicated they would follow a WHS if offered in the future, while a minority of future hospital physicians would not participate in a future WHS. If offered a WHS in the future, feedback on the results is mostly preferred via email or through a face-to-face feedback consultation with an occupational physician, and preferably in their own teaching hospital or at a professional's practice outside the hospital.

Methodological considerations
The development of the job-specific WHS for hospital physicians was based on a stepwise approach[1], the first step of which consisted of providing an evidence base by gathering knowledge on occupational demands and health effects.[2] In addition to the fact that this evidence base has not been provided for hospital physicians until now, it

is considered a particular strength of this thesis that several different research methodologies were used to provide the required information on occupational demands, preferably described in terms of duration, frequency and intensity[3], and health effects. A range of methods has been identified to gather these data, which can be summarized and categorized in order of increasing precision of data gathered from, and increasing invasiveness to, the workers being assessed: self-reports, observational methods and direct measurements.[3] The use of an online self-report questionnaire and performing systematic observations at the workplace provided up to date information on a wide variety of occupational demands and health effects across all medical specialties, which are considered as being representative of the working conditions in which hospital physicians are currently performing. The self-report questionnaire enabled a large number of hospital physicians to be surveyed so that representative data could be gathered, at the expense of being less precise or reliable[3], while real-time observations enabled the required data on the frequency and duration of occupational demands during actual work to be collected.[4] Prior to the development of the self-report questionnaire and the systematic observations, semi-structured interviews were held with hospital physicians of different medical specialties to explore the occupational demands and health effects that should be addressed. Using semi-structured interviews is thought to have great value in a wider and more thorough exploration of specific, possibly sensitive, matters.[5] Input from these interviews also served to develop a measurement strategy for the systematic observations that considered the potential variation in tasks and activities. A measurement strategy was developed that took into account the variation in tasks and activities due to the type of patients and the type of internship of the hospital physician, reflected in the activities they were engaged in during a workday. When also considering the fact that half of all the hospital physicians of one University Medical Center completed the self-report questionnaire, the data obtained from the two observational studies are considered a true and reliable reflection of the occupational demands and health effects of hospital physicians. In addition to these observational studies, performing a systematic literature review[6] provided additional aggregated international evidence on occupational demands and health effects in the work of hospital physicians. A systematic literature review has proved to be a useful addition in gaining knowledge of occupational demands and health effects within a specific occupation.[7,8] Although the evidence base of knowledge on occupational demands and health effects in the work of hospital physicians is strong and reliable, it is important to keep in mind that occupational demands and health effects can be subject to change over time. Especially when considering an occupation that is constantly changing, for example due to changes in techniques[9] or working procedures[10], these changes can occur over time but they can also be applicable for hospital physicians working in general hospitals. However, these changes will take some time and would only result in slight adjustments of the solid evidence-based job-specific WHS for hospital physicians developed in this thesis.

After gathering knowledge on occupational demands and health effects, the next phase consisted of determining the necessary steps to arrive at the content of the job-specific WHS for hospital physicians. Although a job-specific approach of a WHS is much preferred over a general approach[11,12], and has already been developed for other

high-demand jobs such as fire fighters[13], ambulance workers[14], construction workers[8] and nurses[15], the process of arriving at a job-specific WHS has not been described in the international literature. As a result, clear guidance on how to decide which occupational demands or health effects to include was lacking and therefore some of the decisions have been expert-based and lack an evidence-based foundation. Compared to evidence-based decisions, expert-based decisions are considered to be of limited value because of the introduction of subjectivity into a scientific process and inducing the risk that decisions deviate from what could be considered as 'best practice' based on high-quality evidence.[16,17] However, considering the fact that no evidence was available to guide the decision process, expert knowledge and expert-based guidelines had to be used. The starting point that guided the decision process was targeting the aims of the WHS as described in the Dutch guideline: to prevent work-related health complaints and to maintain or improve the health and work ability of hospital physicians.[1] The guideline, describing the steps to arrive at these goals, served as an aid, and it was required to give the exact interpretation of each of the steps for the specific occupational demands and health effects of hospital physicians. For example, the described steps of the guideline included a comparison of the occupational exposures compared with evidence-based guidelines and investigation of the negative work functioning effects that might result from different health effects. However, decision rules needed to be established by the expert group of researchers to finally decide which occupational exposures or health effects were to be included in the WHS, which was done by keeping the aims of the WHS in mind. Whereas creating the content of the WHS is regarded as a complex process in which the overall value of evidence-based knowledge might decrease, the use of expert-based knowledge in creating the content of the job-specific WHS was necessary.[18] As a result, this thesis describes a stepwise process that can serve as a good example of how to develop a job-specific WHS in other (high-demand) jobs.

Implications of findings

Hospital physicians' health as a quality indicator

Healthcare organisations and their employees have one priority: delivering the best possible quality of care. Measures have been taken to improve quality of care and secure patient safety, such as developing a pre-operation checklist to reduce surgical complications[10] and investigating how the management of hospitals is best organised in order to manage and improve quality of care.[19] Additionally, the importance of measuring the quality of care seems to be growing as is reflected in an increased need for transparency and monitoring of performance indicators in healthcare.[20,21] Specific consideration is given to measuring and improving the performance and quality of care delivered by hospital physicians as a quality indicator of care.[22]

Assessing the performance of hospital physicians can serve to provide additional support for underperforming hospital physicians and/or to provide them with feedback about gaps in their knowledge.[23] Measuring the performance of hospital physicians has been found to be complicated, as a discrepancy exists between how physicians

perform in controlled situations and their behaviour in real-time settings.[24] However, of several methods that have been proposed to measure hospital physicians' performance, like peer assessment, the use of simulation patients or video-observation, the use of multisource feedback has been found to be a reliable and valid way of assessment.[25] It can serve as an instrument to measure performance indicators such as the quality of interaction with patients.[26] Another way to assess the performance of hospital physicians is to investigate general measures of work performance, such as the concept of work functioning. This concept refers to the work-related health capacities of an employee to meet the responsibilities of the job[27] and is measured by assessing the capacity to work, the quality of work performance, the quantity of work, and the abilities for recovery after work.[28]

Findings among healthcare personnel have revealed that work functioning can be negatively affected by a reduced health status, thus reflecting a reduced quality of performance.[29] The occupational health of hospital physicians affects patient satisfaction, patient adherence to treatment, interpersonal aspects of patient care and the quality of overall care processes.[30] The gathered knowledge in this thesis provides additional evidence to existing knowledge that hospital physicians are exposed to occupational risks, that sometimes cannot be prevented, and that can result in negative work-related health effects that can negatively affect their work functioning. Thus, hospital physician's occupational well-being is vital for the provision of high-quality care.[31] Therefore, when quality of care really is the main priority of healthcare services, the work-related health of hospital physicians must also be taken into account as a quality indicator.[31] In addition, this thesis revealed that already a significant proportion of the working hospital physicians experience physical and psychological health effects that can reduce work functioning, thus addressing the work-related health must occur on a periodical and preventive basis to ensure prevention or early detection of reduced health and work functioning to maintain high quality of care. This thesis has found that the evidence-based job-specific WHS for hospital physicians is a feasible and acceptable instrument to address this need for periodical and preventive screening of the work-related health and work functioning of hospital physicians.

Taking care of context-specific demands when implementing the WHS

Implementation of occupational health service activities that are considered complex[32], like the job-specific WHS for hospital physicians, can be time-consuming and involves great challenges of communication. Because of the number of different stakeholders involved, and the interaction necessary, the number of complex actions required by the occupational health service and the hospital physicians, the high degree of flexibility required to match the needs of the individual hospital physician[33] and other practical constraints for implementing the job-specific WHS, considerable time needs to be invested to understand and meet the demands of the specific context.[32] Considering the complexity of implementing the WHS, performing a feasibility study is preferred above an effectiveness study to examine to what extent the WHS would be feasible and acceptable as an occupational health strategy in the specific target group.[34]

Investigating and understanding the context is an important factor in determining the acceptability and is crucial to determining to what extent the job-specific WHS might also be considered feasible and acceptable in another setting.[32] Considering the specific cultural attitudes of hospital physicians towards taking care of their own health, reflected in a general tendency to delay or avoid seeking care[35], priority was given to investigating the opinions and attitudes regarding the WHS of all stakeholders (hospital physicians, medical directors and the occupational health service). Would medical directors support the WHS and would hospital physicians actually take part in the WHS? After all, the relatively high number of hospital physicians that participated in the WHS, the organisation and communication of the WHS being labelled as success factors by all stakeholders and the good adherence of the occupational health services to the protocol indicate that the WHS was well developed around the specific context of the target group and is considered feasible and acceptable.

These positive findings not only indicate that the WHS as an occupational health strategy was well received by an apparently reserved target group, but they also stress that, when implementing the WHS on a larger scale or in a different context, time and effort should be invested in examining the context-specific characteristics before implementation. For example, contexts are likely to differ between medical specialties and/or between hospitals with respect to the characteristics of the population and the culture among hospital physicians. In addition, while hospital physicians in University Medical Centers are being employed, this is not the case in other hospitals where hospital physicians work together in partnerships or for general practitioners. As a consequence, this latter group might experience more difficulties finding access to an occupational health service, which is likely to have implications for the proximity and flexibility of the occupational health service, and thus for the feasibility and acceptability of the WHS. The organisation and communication of the WHS must be investigated and adjusted to a different context when necessary to be acceptable and feasible.[36]

Implementation of the WHS needed as preventive measure

The purpose of the feasibility study was to implement and evaluate the WHS to investigate whether it would be accepted by the target group and establish to what extent the WHS was executed by the occupational health service as planned. The findings of the feasibility study have indicated that the WHS is ready to be implemented. The occupational health service followed the protocol as planned and suggested an intervention or gave advice when needed based on the individual results. The hospital physicians greatly valued the WHS as they perceived it to contribute to their general health, work functioning and long-term work ability. However, the medical directors, despite appreciating the communication and organisation of the WHS, indicated that they were dubious about implementing the WHS in the future as they were not convinced about the long-term effectiveness of the WHS. On the one hand, establishing the effectiveness of the WHS on work-related health and work functioning is desirable and helps to increase the acceptability of the WHS among medical directors. Although the interventions that are included in the WHS have been chosen based on their evidence-based effects, investigating what the effects of these interventions are on a hospital physicians' work functioning, and thus on quality of care and patient safety,

is a way forward to establish the effectiveness of the WHS.[31] On the other hand, a comparison between a regular health surveillance and a job-specific WHS among construction workers has shown that the number of preventive actions undertaken by the employees increases when following a job-specific WHS.[37] In addition, simply devoting attention to the topic of work-related health would appear to lead to an increase in preventive actions to maintain good health and work functioning.[38] Taking into account the high need of preventive actions regarding work-related health, reflected by the fact that a relatively high number of hospital physicians continue to work when sick, thereby jeopardizing the quality of care delivered, implementation of the WHS is likely to increase the awareness of the risk of a reduced health status. It also contributes to the number of preventive actions taken to maintain good health and work functioning and thereby indirectly helps to secure patient safety. As the job-specific WHS also complies with the legal obligation of employers to provide a WHS to their employees[39], implementation of the WHS is recommended and medical directors and the board of directors of hospitals should discuss the options with their occupational health service.

Changes in cultural health care attitudes needed for the WHS to be effective

Although the job-specific WHS can serve as an occupational health strategy that aims at maintaining or improving the quality of care by taking care of the work-related health and work functioning of hospital physicians, reduced work functioning with a resultant poorer performance is thought to occur in an interplay between the individual hospital physician and the professional context.[31,40] An important aspect of this professional context that needs to be addressed to effectively take care of the work-related health of hospital physicians relates to their health culture.

Culture is defined as 'the set of shared, taken-for-granted implicit assumptions that a group holds and that determines how it perceives, thinks about and reacts to its various environments'.[41] Perceptions, thoughts and behaviours contributing to the onset and continuation of diminished health and reduced work functioning are deeply embedded in the system of clinical practice and the healthcare profession.[42,43] Hospital physicians have the tendency to delay or avoid seeking help by neglecting their symptoms or trivializing the potential negative effects.[35] Furthermore, they might turn to self-prescription or continue to work when sick.[35,44] Whereas norms and beliefs are formed around the way one reacts to critical incidents, the behaviour of hospital physicians when suffering from health complaints then becomes the norm.[45]

In order to change the way in which hospital physicians take care of their occupational demands and work-related health, a shift in the culture of care and wellness of physicians is necessary. Because these cultural attitudes and behaviours are the result of values that have persisted throughout time and are therefore taken for granted, a culture arises in which this topic is no longer discussed. As was also concluded in this thesis (Chapter 6), a necessary first step in changing the healthcare culture is to start discussing the topic. An increased awareness among hospital physicians and their employers of the importance of good work-related health, and the potential negative consequences of reduced health for work functioning and quality of care is needed.[31] If they do not understand the importance of healthy physicians and the underlying

assumptions responsible for the current healthcare behaviour, it is unreasonable to expect this behaviour to change. Therefore, it is important to address work-related health and work functioning also on a system level rather than solely as an individual issue.[40]

Possible measures to change cultural aspects of healthcare behaviour

Because culture is affirmed and reproduces itself through the socialisation process of new members entering the group[45], one of the possibilities at a system level to change the culture among hospital physicians is to focus on the new generation of hospital physicians. Educating medical students about the potential negative effects of the occupational demands they will encounter, and stressing the importance of good health by educating them concerning how a reduced health status negatively affects the quality of their performance and jeopardizes patient safety helps to change the culture by increasing awareness of the importance of good health. Consequently, during medical school and medical residency, more attention should be given to the topic of occupational health. Results of a preventive programme among junior doctors in the UK, consisting of only 1.5 hours of education in total during the first two years of the educational programme, suggest that simply pointing out to junior doctors the potential negative effects of reduced health might be sufficient to increase their awareness.[46]

The socialisation process occurs for a large part through education of the new generation of hospital physicians by the cultural-related behaviour of the current generation of (teaching) hospital physicians, who are often unaware that they are projecting their own norms and values onto these new group members.[45,47] The current generation of hospital physicians act as role models, which is believed to be an important teaching method in shaping the values, attitudes and behaviours of residents.[48,49] Young hospital physicians acquire their knowledge and attitudes for a large part from observing current hospital physicians, and displaying a good professional attitude towards younger hospital physicians especially seems to have a great impact on the younger physician.[48,49] In addition, the overall teaching performance also influences being seen as a role model.[50] Therefore, the current generation of hospital physicians should be aware of their influence on the attitudes of their younger colleagues and display behaviour that reflects an honest attitude towards their own work-related health and work functioning. A measure at a system level to affect the cultural attitudes and healthcare-related behaviour of hospital physicians, which indirectly contributes to maintaining or improving the quality of care, should therefore be directed at the current generation of hospital physicians. These measures could consist of refresher courses to increase the awareness of the potential negative effects of diminished work-related health, and of the effects of their displayed behaviour towards medical students. Guidelines of competencies[51,52] could be translated into practice to guide their professional behaviour and enhance specific domains of teaching performance, which could also lead to hospital physicians more actively participating in quality improvement actions, thereby helping to improve the quality of care.[50,53]

Organisational attention to the health of hospital physicians

As implementation of the job-specific WHS is recommended as an occupational health strategy to maintain good health and work functioning of hospital physicians, the question could be asked as to who should take responsibility for the organisation and implementation of this intervention. As the national government provides regulations that state that an employer is required to make WHS periodically available for all workers[39], the board of directors, who employ hospital physicians, are primarily responsible for initiating the WHS. Although in practice the (in-house) occupational health service will usually play an active role in advising the board and in organising and executing the WHS[1], the medical directors and board of directors are thought to play a crucial role in their responsibility of keeping hospital physicians healthy on the job. First of all, they are considered to be primarily accountable for the norms and beliefs held by the population regarding the importance of taking care of one's own work-related health.[41] Thus, any attempts to change the cultural healthcare attitudes among hospital physicians have greater chances of succeeding when initiated, or at least supported, by medical directors and the board of directors. In addition, their knowledge regarding the norms and beliefs among hospital physicians is required to be able to optimize the organisation and communication of the WHS to maintain or improve its acceptability.[36] In this thesis, discussing the optimal way of organisation and communication of the WHS with several medical directors has been found to be of crucial importance in increasing the acceptability of the WHS. Furthermore, discussion at the management level of both the importance of healthy and well-functioning hospital physicians, as well as discussing measures for maintaining or improving them, is likely to affect the actual number of measures taken to take care of these matters.[19] These worksite policies supporting a culture of health are important in helping employees adopt and maintain healthy behaviours.[54]

However, motives of executives were often directed towards exerting control, and driven by financial arguments.[41] If they assume the intervention will not be beneficial, they will not support the intervention.[41] Although the effectiveness of the job-specific WHS remains to be investigated, previous findings have revealed that a worksite culture of health helps improve the effectiveness of any health promotion intervention, which then also leads to higher productivity.[54] Actions to increase the effectiveness should be targeted at offering experiences that increase awareness, enhancing motivation to participate, and offering supportive measures that create a working environment that supports health-promoting behaviour.[54]

Assessing the cost-benefit ratio might be difficult, since this ratio is likely to differ between stakeholders due to their different perspectives.[55] When offering hospital physicians a WHS, all costs are most likely to be the hospital's responsibility, while the benefits also have an impact on other stakeholders, such as patients and society as a whole. When considering the situation in which hospital physicians are working in a partnership, the employer does not offer or pay for a WHS, the national government in the Netherlands has provided a system that makes the health insurance companies the most likely stakeholders to be responsible for financing the WHS. In addition, while assessing the costs related to introducing the WHS might be straightforward, assessing

the benefits seems rather complex. A previous study investigating the cost-effectiveness of a WHS among nurses to promote mental health assessed the benefits by gains due to reduced absenteeism or losses due to reduced work functioning while working (presenteeism).[56] They found that introduction of the WHS, compared to taking no action, led to a return on investment of €11 for every €1 invested. Even when the benefits were assessed by only looking at gains due to reduced absenteeism, the return on investment is still €5 for every €1 invested.[56]

Overall then, instead of having concerns about the WHS being beneficial, either financially or productively, organisational attention by medical directors and/or the board of directors towards promoting health behaviour is encouraged as it is considered vital if the WHS is to be effective in maintaining or improving the work-related health and work functioning of hospital physicians and in having a chance to improve quality of care.

Recommendations for practice and research

Implications and recommendations for the occupational physician:

- Contact the hospital board of directors and the HR-department to take the initiative to implement the job-specific WHS.
- When the WHS is intended to be implemented, take sufficient time and effort to investigate the specific contextual demands. Slight adjustments in the communication and organisation of a developed job-specific WHS is thought to maximize the acceptability of the WHS.

Implications and recommendations for medical directors and hospital boards of directors:

- Implementation of the job-specific WHS as a preventive occupational health strategy is strongly recommended to take care of the work-related health and work functioning of hospital physicians, which is likely to positively affect the delivered quality of care, and helps secure patient safety.
- Integrate hospital physicians' health and work functioning as a quality indicator of care, as a reduced health status can jeopardize patient safety.
- Implement strategies and methods, such as providing guidelines or refresher courses, to actively increase awareness among the current and new population of hospital physicians regarding the potential negative consequences of a reduced health status on work functioning and quality of care.
- Communicate the importance of good work-related health to contribute to an increased number of hospital physicians taking care of their own work-related health.

Implications and recommendations for medical education and medical residency:

- Make teaching hospital physicians aware of their influence as a role model in shaping the values, attitudes and behaviours of medical students and medical residents.
- Provide teaching hospital physicians with courses and guidelines to enhance their overall teaching performance and guide and shape their professional behaviour, as this positively affects their role model as a teacher and hospital physician.

Recommendations for research

- Evaluate the job-specific WHS when it is implemented on a larger scale. It is important to investigate whether the evidence-based interventions of the WHS maintain or improve the work-related health and work functioning of hospital physicians in the longer term.

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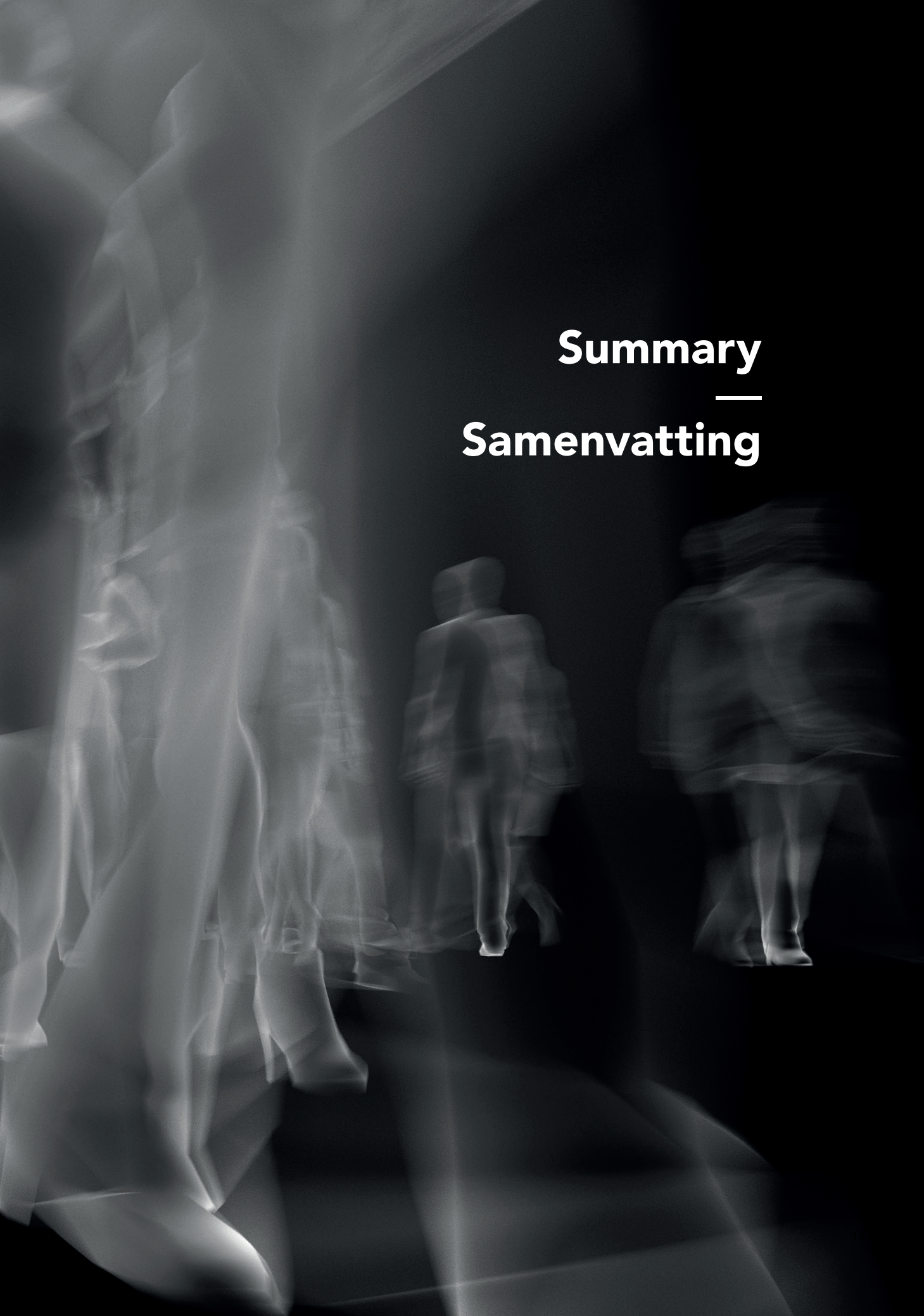
CHAPTER 7



Summary

Samenvatting

Summary

Monitoring of employees in occupational health aims at the early detection of signs of reduced health or diminished work functioning, to then be followed by appropriate interventions to improve health or work functioning. This is called a Workers' Health Surveillance (WHS). In order to be effective, the WHS should be designed based on evidence obtained from the occupation of interest, so that it is relevant to the job-specific nature of work demands and health effects.

Hospital physicians (medical specialists and medical residents) are faced with context-specific occupational demands threatening their health and work functioning. The presence of psychological and/or physical health complaints not only affects the individual, but can also influence the quality of patient care, and subsequently threaten patient safety. A job-specific WHS for hospital physicians, when perceived as being feasible and acceptable, can serve as an occupational health strategy to safeguard and maintain good workers' health and quality of care.

Therefore, the aim of this thesis was to develop and implement a job-specific WHS for hospital physicians, which led to the following two objectives:

i. To provide evidence for a job-specific WHS for hospital physicians; and
ii. To evaluate whether the developed job-specific WHS for hospital physicians is feasible and acceptable.

To address these objectives, the following research questions were formulated:

1. What are the occupational demands and work-related health effects, and resulting work functioning effects, of hospital physicians?
2. What are the steps necessary to create the content of the job-specific WHS?
3. Is the new job-specific WHS feasible and acceptable?
4. What are the care needs of future hospital physicians?

1. What are the occupational demands and work-related health effects, and resulting work functioning effects, of hospital physicians?

To provide an evidence base for a job-specific workers' health surveillance for hospital physicians, insight into the occupational demands, work-related health effects and resulting work functioning effects is required. To gather information concerning the psychological health effects among hospital physicians, **Chapter 2** addresses the prevalence of several common mental disorders. Using an online questionnaire, all hospital physicians and medical residents of one academic medical centre (N=958) were invited to participate in order to assess the prevalence of burnout, work-related fatigue, stress, posttraumatic stress disorder (PTSD), anxiety and depression. Based on 423 completed questionnaires, prevalence rates among hospital physicians are as follows: burnout 6%, work-related fatigue 42%, stress complaints 15%, PTSD 15%, anxiety complaints 24% and depression 29%. In order to investigate whether having a psychological health effect is related to reporting reduced work functioning, the association between the presence of a mental health problem and perceived current work ability is also addressed in this chapter. Compared to hospital physicians without a mental health

problem, those with scores indicative of having a mental health problem are between 4- and 14-fold more likely to report their current work ability as insufficient compared to their work ability in their best period (score ≤ 5, scale 0-10). Thus, the presence of psychological health effects increases the odds of reduced work ability, which in turn can negatively affect working performance and increases the risk for long-term sickness absence.

Knowledge concerning physical occupational demands and physical health is addressed in **Chapter 3**. In addition, the perceived relation between physical occupational demands and physical health on the one hand, and perceived work functioning on the other hand is investigated. Physical job demands are addressed by quantifying them in terms of duration, frequency and intensity by performing a hierarchical task analysis at the workplace as well as by using an online questionnaire to ask whether hospital physicians have felt seriously bothered in work functioning by any of several physical occupational demands or physical health effects in the previous few weeks. The hierarchical task analysis is executed by performing 126 on-site observations with medical residents of different medical specialties, which are used to examine daily demands. Surgeons are compared to (other) hospital physicians. During an average working day, hospital physicians spent more time sitting than standing (6 vs. 3 hours) compared to surgeons (4 hours each). Surgeons make fine repetitive movements for a significantly longer period (80 minutes) compared to other hospital physicians (3 minutes), while the latter work significantly longer at a computer compared to surgeons (104 vs. 73 minutes). Compared to the other hospital physicians, a larger proportion of surgeons find their work physically strenuous (41 vs. 14% respectively), feel seriously bothered by making prolonged repetitive movements (35 vs. 18%), by working in uncomfortable or exhausting postures (73 vs. 27%) and by using hand tools (8 vs. 3%). For both groups, the most frequently reported physical complaints are located in the neck (29-35%), upper and lower back (14-25%) and shoulder (15-23%) region. Except for physical complaints in the hip region, at least half of the surgeons who report long-standing physical complaints in other bodily regions frame these complaints as being work-related. In addition, at least one in every three surgeons who report physical complaints in the shoulder, forearm, wrist/hand and knee region indicates that these complaints impair their work functioning. The majority of surgeons (86%) and other hospital physicians (79%) indicate that their physical state rarely makes it difficult to cope with the physical occupational demands. On the other hand, 14% of the surgeons and 21% of other hospital physicians still indicate that their physical state makes it difficult to cope occasionally with the physical occupational demands.

Taken together, including the results of a systematic literature study (**Appendix Chapter 4**) used to complete this evidence base, hazardous occupational demands of hospital physicians include physical work demands, psychosocial work demands, exposure to biological and chemical substances, exposure to emotionally demanding situations, and exposure to noise and radiation. Hospital physicians experience physical health complaints, mainly in the upper extremity region, of which a considerable proportion is framed as being work-related and is said to impair their work functioning. Psychological health complaints are also prevalent among hospital physicians, with prevalence rates varying from 6% for burnout to 42% for work-related fatigue.

2. What are the steps necessary to create the content of the job-specific WHS?
After having provided an evidence base for the hazardous occupational demands, work-related health effects and resulting work functioning effects of hospital physicians, the following step consists of developing decision trees for the different types of occupational demands. These aim to establish whether or not to consider inclusion of work-related health effects known to be related to job demands or whether or not to consider inclusion of aspects of health that reflect insufficient health requirements of the individual hospital physician to meet the demands of the job. To make a final decision on inclusion or exclusion, a-priori decision rules are followed that use the information resulting from the questions of the decision trees. These decision rules take into account the prevalence and the impact of the health- or work-functioning effect and, regarding the psychological exposures, the prevalence of an emotionally demanding situation. To complete the content of the job-specific WHS, targeted advice and/or interventions were selected from guidelines and literature.

The resulting job-specific WHS for hospital physicians consists of a questionnaire and biometric tests to assess the following physical and psychological health requirements: no impairments due to musculoskeletal disorders, sufficient vision, sufficient hearing, recent exposure to hazardous substances (with effects to skin and respiratory tract), recent exposure to bodily material of patients to check the taken procedures, alertness and judging ability (which includes exposure to emotionally demanding situations (such as violence or abusive behaviour), psychological health complaints, drug use, alcohol consumption, sleepiness and work-related fatigue), work ability, and risk for cardiovascular diseases. In addition, the job-specific WHS provides the occupational physician (and his/her assistant) with a protocol guiding the procedure for performing the biometric tests as well as with an intervention protocol guiding the process of providing individual feedback on the results to the individual hospital physician and, when applicable, giving advice or providing an intervention. The interventions proposed in the intervention protocol are mainly based on existing evidence-based literature and international guidelines. They are directed at increasing the personal abilities or capacities of the individual to cope with the occupational demands, or they consist of (ergonomic) measures or medication or act on the individual organisation of work interaction.

3. Is the new job-specific WHS feasible and acceptable?
To investigate to what extent the developed job-specific WHS for hospital physicians is perceived feasible and acceptable, **Chapter 5** describes the results of the feasibility study. The study consists of a pilot implementation and process evaluation with all involved stakeholders of three medical specialties: the hospital physicians, the medical managers of the three medical specialties, an occupational physician and an occupational physician's assistant.
Feasibility is defined as the extent to which the job-specific WHS is implemented as planned and proposed, and is investigated by identifying the received and delivered dose, success factors and potential obstacles. A total of 35 hospital physicians (38% of 93 invited) agreed to participate, of which 32 (34%) completed the WHS and 30 completed the written evaluation. Regarding the received dose, 91% (32 of 35) of the

hospital physicians completed the questionnaire, performed the medical test and consulted the occupational physician to receive feedback on their results. On almost all occasions (92%), the occupational physician gave advice or suggested an intervention when it was required based on the results of the individual hospital physician. The perceived benefits of taking part in the WHS are labelled as a success factor, as well as the proximity and the flexibility of the occupational health service and the clear communication to the hospital physicians. The workload of the occupational physician's assistant is considered an obstacle. Offering an online questionnaire instead of a paper-and-pencil form is suggested as a suitable change to reduce the workload.

Acceptability is assessed by asking whether a future WHS is considered desirable and feasible by the stakeholders involved. Therefore all stakeholders are asked about their appreciation of both the current WHS as well as a future WHS and they are asked whether they intend to participate in or facilitate a future WHS (in the case of the occupational physician, his assistant and the medical directors of the medical specialties). Additionally, hospital physicians and medical residents are asked whether they expect the WHS to positively affect i) their general health; ii) their work functioning; and iii) their long-term work ability. Both the current WHS and the ability to participate in a future WHS are appreciated with a mean score of 8 (scale 0-10, ranges 6-10 and 3-10, respectively). The majority of hospital physicians (28/30) intend to participate in a future WHS when offered. Most of them believe that participation benefits their general health (24/29), work functioning (20/29) and long-term work ability (22/29). The medical directors are satisfied with the current WHS and suggest maintaining this organisation in the future, but they doubted the long-term effectiveness of the WHS on work-related health and work ability. Overall, the job-specific WHS for hospital physicians was found to be feasible and acceptable.

4. What are the care needs of future hospital physicians?

As the general perceived attitude of current hospital physicians regarding their own healthcare needs and healthcare behaviour is thought to be a potential obstacle for maintaining and/or improving good work-related health by implementing the WHS, specific consideration is given to investigating the attitudes of the future hospital physicians regarding their own healthcare needs and behaviour. **Chapter 6** describes to what extent future hospital physicians (divided into three groups: medical students, clinically active students and recently graduated hospital physicians) have current care needs, and anticipate for future care needs, to what extent they worry about their current health status, and in what ways future hospital physicians would like to receive advice and support to maintain good work-related health in the future. As part of the third wave of a cohort study among medical students, an online questionnaire was sent to medical students of two medical schools in the Netherlands to gather information. Complete data on 647 respondents have been available for analysis.

Relatively few future hospital physicians (27%) express serious worries about their current health status, while a larger proportion indicate that they currently need care regarding psychological (42%) or physical (40%) complaints. Regarding future care

needs, more than half of the future hospital physicians (52%) would consider addressing their care needs if a future WHS were to be offered. There is no association between having worries about their current health and their anticipated future health care needs. Despite having few worries about their current health status, they would consider taking part in a future WHS. Reasons for considering following a future WHS are a perceived positive contribution of following a WHS to their own and patient safety, to the quality of their work and to improving or maintaining good health. Concerns regarding the consequences for their employment or for their health status are some examples of explanations of a minority (12%) of future hospital physicians that indicate they would not follow a WHS if offered in the future. A trend seems apparent that as medical career progresses, both current and future care needs decrease.

If a WHS were to be offered in the future, the majority of future hospital physicians would prefer receiving feedback on their results by email (54%) or through a face-to-face feedback consultation with the occupational physician (51%). The preferred locations for receiving any interventions are their own teaching hospital (68%) or a professional's practice outside the hospital (34%).

From this study, it can be concluded that despite having few worries about their current health, there is a clear need for prevention and treatment of work-related health complaints among future hospital physicians. This might reflect a significant difference between experiencing health complaints and actually worrying about them and their potential negative consequences on others, which calls for better education on the potential negative effects of a reduced health status on work functioning and patient safety.

Chapter 7 describes the main findings, methodological considerations, implications of findings, and recommendations for practice and research.
In answer to the first research question, an evidence base of occupational demands, work-related health effects and resulting work functioning problems for hospital physicians was established. Developing decision trees for the different occupational demands, followed by using a-priori decision rules to decide on inclusion of the related health effects concluded by selecting targeted advice or interventions from guidelines and literature are described as the necessary steps for deciding the content of the job-specific WHS (research question 2). Regarding the third research question, the feasibility study revealed that the job-specific WHS was executed as planned and proposed and was accepted by the target group. Research question 4 is answered by stating that future hospital physicians, despite having few worries about their current health, expressed both current and future care needs that can be addressed by periodically offering the job-specific WHS.

The next step for the occupational physician is to contact the hospital board of directors and the HR department to take the initiative to implement the job-specific WHS. The medical directors and hospital boards of directors are recommended to implement the WHS as a preventive measure and to integrate hospital physicians'

health and work functioning as a quality indicator of care. Researchers are recommended to evaluate the WHS when it is implemented on a larger scale to investigate whether the evidence-based interventions maintain or improve the work-related health and work functioning of hospital physicians. Additionally, it is strongly recommended to increase the awareness among medical students of the potential negative effects of a reduced health status by integrating the subject in the curriculum of medical school. Furthermore, implementing strategies and methods to increase the awareness among (teaching) hospital physicians of the role model they are and of potential consequences of a reduced health status on quality of care and patient safety is recommended.

Samenvatting

In het veld van 'arbeid en gezondheid' richten professionals zich op diverse aspecten van de aan het werk gerelateerde gezondheid. Dat aan het verrichten van werkzaamheden in de meeste, zo niet in alle beroepen, in meer of mindere mate risico's verbonden zijn die de gezondheid negatief kunnen beïnvloeden, lijkt evident. Wanneer de gezondheidseffecten echter de vaardigheden die nodig zijn om het werk goed uit te voeren aantasten, betekent een verminderde gezondheid ook een verminderde arbeidsprestatie. In het geval dat de aan het werk gerelateerde gezondheidseffecten pas laat gesignaleerd en/of behandeld worden, dan geldt niet alleen een reeds verstreken periode van verminderd functioneren en presteren, maar nemen ook de risico's op langdurig ziekteverzuim toe. Tijdige signalering en aanpak van een verminderde aan het werk gerelateerde gezondheid is daarom een vereiste om een werknemer gezond en goed functionerend aan het werk te houden. Het zogenaamde Preventief Medisch Onderzoek (PMO) is een arbeidsgezondheidkundige strategie die preventief ingezet kan worden voor het tijdig opsporen en signaleren van werk gerelateerde gezondheidsklachten of verminderd functioneren, waarna adviezen verstrekt of interventies aanbevolen kunnen worden om de gezondheid of het functioneren van de werknemer te behouden of te bevorderen. Echter, om binnen een specifiek beroep als effectief preventief instrument te kunnen dienen is het van belang dat het PMO wordt gebaseerd op onderzochte en bewezen beroepsspecifieke kenmerken, zodat het PMO aansluit bij de beroepsspecifieke blootstellingen en aan het werk gerelateerde gezondheidsklachten.

Van ziekenhuisartsen (medisch specialisten en artsen in opleiding tot specialist (AIOS)) is bekend dat zij in het werk worden blootgesteld aan specifieke factoren in het werk binnen de geneeskunde die hun werk gerelateerde gezondheid negatief kunnen beïnvloeden. Wanneer de ziekenhuisarts als gevolg hiervan niet of verminderd in staat is aan de taakeisen van het werk tegemoet te komen, wordt ook het werk functioneren daarmee negatief beïnvloedt. De eventuele aanwezigheid van psychologische of fysieke klachten, ongeacht de oorsprong van die klachten, beïnvloedt derhalve niet alleen de eigen gezondheid negatief, maar is door een verminderd functioneren van de ziekenhuisarts ook een bedreiging voor het leveren van de optimale kwaliteit van zorg. Ziekenhuisartsen met een verminderde aan het werk gerelateerde gezondheid vormen dus niet alleen een bedreiging voor zichzelf, maar ook voor anderen. Een beroepsspecifiek PMO, dat binnen de beroepsgroep haalbaar en geaccepteerd is, kan dienen als een arbeidsgezondheidkundige strategie die zowel de gezondheid van de ziekenhuisarts als de kwaliteit van zorg voor de patiënt bewaakt en bevordert. Dit bestond echter tot nu toe niet.

Het doel van dit proefschrift is om een op wetenschappelijk bewijs gebaseerd beroepsspecifiek Preventief Medisch Onderzoek (PMO) voor ziekenhuisartsen te ontwikkelen en te implementeren. Hiertoe zijn de volgende twee doelstellingen bepaald:

i. Het vaststellen van een wetenschappelijke onderbouwde inhoud van een beroepsspecifiek PMO voor ziekenhuisartsen;
ii. Evalueren of het ontwikkelde beroepsspecifieke PMO voor ziekenhuisartsen haalbaar en geaccepteerd is.

Om deze doelstellingen te bereiken, zijn de volgende vraagstellingen geformuleerd:

1. Wat zijn de taakeisen en gezondheidseffecten, en de daaraan verbonden functioneringsproblemen, in het werk van ziekenhuisartsen?
2. Wat zijn de benodigde stappen om tot de inhoud van het PMO te komen?
3. Is het nieuwe beroepsspecifieke PMO haalbaar en geaccepteerd?
4. Wat zijn zorgbehoeften van toekomstige ziekenhuisartsen?

1. Wat zijn de taakeisen en gezondheidseffecten, en de daaraan verbonden functioneringsproblemen, in het werk van ziekenhuisartsen?

Om het beroepsspecifieke PMO voor ziekenhuisartsen wetenschappelijk te onderbouwen, is inzicht nodig in de specifieke taakeisen, blootstellingen en aan het werk gerelateerde gezondheidsklachten en functioneringsproblemen. Deze wetenschappelijke basis is verkregen door middel van diverse onderzoeksmethoden. Naast het gebruik van een online vragenlijst en het uitvoeren van een observaties tijdens het werk (die staan beschreven in **Hoofdstuk 2 en 3** van dit proefschrift), is tevens een systematisch literatuur onderzoek uitgevoerd (zie de **appendix bij Hoofdstuk 4**).

Inzicht in het vóórkomen van psychologische gezondheidseffecten is verkregen door alle ziekenhuisartsen van één universitair medisch centrum in Nederland uit te nodigen voor deelname aan een online vragenlijstonderzoek (**Hoofdstuk 2**). Dit online vragenlijstonderzoek heeft in breder opzicht het doel gehad om informatie te verzamelen ten aanzien van de ervaren belasting en taakeisen in het werk, het vóórkomen van diverse gezondheidsklachten, het huidig werkvermogen, het eigen gezondheidsgedrag en leefstijl en psychosociale aspecten van het werk. Middels deze vragenlijst zijn de prevalenties van burn-out, werk gerelateerde vermoeidheid, posttraumatisch stresssyndroom, stress, depressie en angst onder ziekenhuisartsen vastgesteld. Ook is onderzocht of het hebben van een psychologisch gezondheidseffect gerelateerd is aan het rapporteren van een verminderd werk functioneren. Daartoe is bekeken of artsen met een psychologisch gezondheidsklacht ook hun eigen huidig werkvermogen ten opzichte van het werkvermogen in hun beste periode als onvoldoende rapporteren (i.e. een score ≤ 5 op een schaal van 0-10). De gevonden prevalenties van de psychologische gezondheidseffecten onder ziekenhuisartsen zijn: burn-out 6%, werk gerelateerde vermoeidheid 42%, posttraumatisch stresssyndroom 15%, stress 15%, angst 24% en depressie 29%. Daarnaast blijkt dat ziekenhuisartsen waarbij een psychologische gezondheidsklacht aanwezig is een 3,5 tot 13,6 keer grotere kans hebben om hun eigen werkvermogen als onvoldoende in te schatten in vergelijking met ziekenhuisartsen zonder psychologische gezondheidsklachten. Ofwel, het hebben van een psychologisch gezondheidsklacht vergroot de kans op een verminderd werkvermogen, hetgeen op haar beurt kan leiden tot verminderd functioneren en tot een vergroot risico op lange-termijn verzuim.

Kennis met betrekking tot fysieke taakeisen in het werk en de prevalentie van fysieke gezondheidsklachten is opgedaan in **Hoofdstuk 3**. Ook is onderzocht wat de ervaren relatie is tussen de fysieke taakeisen in het werk en de aanwezigheid van een fysiek gezondheidsklacht enerzijds en de ervaren functioneringsproblemen anderzijds. Met

andere woorden, ervaren ziekenhuisartsen hinder in het werk van bepaalde fysieke taakeisen of fysieke gezondheidsklachten? De fysieke taakeisen zijn in kaart gebracht door zowel observaties tijdens het werk uit te voeren en de taakeisen te kwantificeren in termen van duur (hoe lang) en frequentie (hoe vaak), als door middel van een vragenlijst te onderzoeken van welke fysieke taakeisen een ziekenhuisarts gedurende de laatste weken tijdens het werk veel hinder heeft ervaren. Hierbij zijn twee groepen met elkaar vergeleken: chirurgen en de groep overige ziekenhuisartsen. Tijdens een gemiddelde werkdag zitten de overige ziekenhuisartsen in vergelijking met chirurgen relatief langer dan dat ze staan (respectievelijk 6 uur en 3 uur versus 4 uur voor beide groepen). Chirurgen voeren daarentegen in vergelijking met de overige ziekenhuisartsen significant langer repeterende fijn motorische handelingen uit (80 minuten versus 3 minuten voor de overige ziekenhuisartsen), terwijl de overige ziekenhuisartsen relatief meer tijd spenderen achter hun computer in vergelijking met de chirurgen (104 minuten versus 73 minuten). In vergelijking met de overige ziekenhuisartsen vindt een groter deel van de chirurgen het werk fysiek inspannend (41% versus 14%) en ervaart hinder in de uitvoer van het werk door het maken van langdurige, herhaalde bewegingen (35% versus 18%), van het moeten werken in oncomfortabele en uitputtende houdingen (73% versus 27%) en van het gebruik van handgereedschappen (8% versus 3%). Beide groepen rapporteren de meeste gezondheidsklachten rond de nek (29-35%), in de onder- en bovenrug (14-25%) en in de schouderregio (15-23%). Met uitzondering van de ervaren klachten in de heup, geeft meer dan de helft van de chirurgen aan dat de overige klachten die zij ervaren werk gerelateerd zijn. Daarnaast geeft minsten één derde van de chirurgen die klachten rapporteren in de knie-, schouder-, onderarm- en hand/pols regio aan dat de klachten hen beperken in het uitvoeren van het werk. Hoewel het merendeel van de chirurgen (86%) en overige ziekenhuisartsen (79%) aan geeft dat hun fysieke gesteldheid het hen zelden moeilijk maakt om te gaan met de fysieke taakeisen van hun werk, geeft nog steeds 14% van de chirurgen en 21% van de overige ziekenhuisartsen aan dat zij hier wel degelijk moeite mee hebben.

2. Wat zijn de benodigde stappen om tot de inhoud van het PMO te komen?
Tot dusver is beschreven hoe op basis van een multi-methode aanpak bestaande uit een online vragenlijstonderzoek, het uitvoeren van observaties tijdens het werk en een systematisch literatuuronderzoek (waarvan een deel in hoofdstuk 2 en 3 van dit proefschrift beschreven staat) is onderzocht welke specifieke taakeisen, blootstellingen, werk gerelateerde gezondheidseffecten – en daaraan verbonden functioneringseffecten – binnen het werk van ziekenhuisartsen aanwezig zijn. Echter, hoe kom je nu op basis van al deze informatie tot de inhoud van een beroepsspecifiek PMO? Welke aspecten neem je wel op in het PMO en welke niet? Hoe ziet het PMO voor ziekenhuisartsen er dan uiteindelijk uit? Het beantwoorden van deze vragen is met name relevant, omdat je de ziekenhuisartsen uiteindelijk in het PMO niet wilt blootstellen aan een overvloed aan vragen en medische testen, waarbij de kans bestaat dat een deel van die vragen of medische testen geen enkele relatie of relevantie heeft tot de aan het werk gerelateerde gezondheid of het werk functioneren.

De eerste stap in dit proces is het opstellen van een beslisboom geweest. Voor de verschillende beroepsspecifieke taakeisen en blootstellingen (psychologisch, fysiek, biologisch, chemisch en fysisch) is een aparte beslisboom opgesteld met als doel te kunnen vaststellen welke werk gerelateerde gezondheidseffecten of overige klachten, waarvan bekend is dat ze een gevolg kunnen zijn van de taakeisen of waarvan bekend is dat ze leiden tot een verminderd functioneren omdat de ziekenhuisarts niet in staat is om aan de taakeisen van het werk te kunnen voldoen, in aanmerkingen komen voor opname in het PMO. Om de uiteindelijke keuze voor in- of exclusie in het PMO te maken zijn op voorhand een aantal beslisregels opgesteld en gevolgd. Deze beslisregels maken gebruik van de informatie die uit de verschillende beslisbomen naar voren is gekomen en houdt rekening met twee factoren: de prevalentie en de ernst van het gezondheidseffect of het daaraan gerelateerde functioneringsprobleem. Wanneer het een psychologische blootstelling betrof is tevens de prevalentie van een emotioneel belastende situatie meegenomen.

Het wetenschappelijk gefundeerde, beroepsspecifieke PMO voor ziekenhuisartsen dat hieruit is ontstaan, bestaat uit het afnemen van een vragenlijst en het ondergaan van een aantal biometrische onderzoeken, gevolgd door een individueel feedback gesprek met een bedrijfsarts. Met behulp van de vragenlijst en de biometrische onderzoeken worden de volgende fysieke en psychologische belastbaarheidseisen in kaart gebracht: beperkingen door klachten aan het bewegingsapparaat, voldoende gezichtsvermogen, voldoende gehoorvermogen, blootstelling aan schadelijke stoffen (zowel via de huid als via de longen), blootstelling aan biologisch materiaal, waakzaamheid en oordeelsvermogen (waartoe behoren: blootstelling aan emotioneel belastende situaties, psychologische gezondheidseffecten als stress, angst en depressie, medicijngebruik, alcoholgebruik, slaapbehoefte en werk gerelateerde vermoeidheid), werkvermogen en risicofactoren voor het optreden van hart- en vaatziekten. Daarnaast is zowel een handleiding voor de bedrijfsarts (en zijn/haar assistent(e)) gemaakt dat ter ondersteuning dient van de uitvoer van de biometrische onderzoeken, als een interventieprotocol, waarin de bedrijfsarts een overzicht vindt van de resultaten en gegevens van de individuele ziekenhuisarts en een daarbij behorend overzicht van passende adviezen of interventies. De interventies zijn gebaseerd op bestaande literatuur en (inter)nationale richtlijnen. De interventies kunnen gericht zijn op het vergroten van de belastbaarheid van de ziekenhuisarts om aan de taakeisen te kunnen voldoen, op het nemen van (ergonomische) maatregelen of medicatie en/of op de interactie tussen de werknemer en de eisen en/of omstandigheden van het werk.

3. Is het nieuwe beroepsspecifieke PMO haalbaar en geaccepteerd?
Voordat in een later stadium onderzocht kan worden of het beroepsspecifieke PMO voor ziekenhuisartsen daadwerkelijk bijdraagt aan het behouden en bevorderen van de aan werk gerelateerde gezondheid, is eerst middels een haalbaarheidsstudie nagegaan in hoeverre het PMO binnen de betreffende populatie haalbaar is en geaccepteerd wordt. De haalbaarheidsstudie is vormgegeven door een pilot-implementatie van het PMO uit te voeren bij drie medisch specialismen (chirurgie, radiotherapie en gynaecologie/verloskunde) in één universitair medisch centrum, gevolgd door een

proces evaluatie met alle betrokken belanghebbenden (de ziekenhuisartsen van de drie medisch specialismen, de betrokken afdelingshoofden, de bedrijfsarts en zijn assistente). Bij de haalbaarheidsstudie is gebruik gemaakt van schriftelijke evaluatieformulieren en semigestructureerde interviews om de benodigde informatie te verkrijgen.

Middels de pilot-implementatie is de haalbaarheid van het PMO onderzocht, gedefinieerd als de mate waarin het PMO werd uitgevoerd zoals gepland en bedoeld. Daarbij is gekeken naar bevorderende en belemmerende factoren, maar ook naar het aantal ziekenhuisartsen dat daadwerkelijk deelneemt aan het PMO en naar de vraag of de ziekenhuisartsen, wanneer op basis van hun resultaten van toepassing, daadwerkelijk één of meerdere adviezen van de bedrijfsarts, passend bij die resultaten, hebben ontvangen. Na een uitnodiging te hebben ontvangen om deel te nemen aan het PMO, hebben 35 van alle ziekenhuisartsen van de betrokken medische specialismen (38% van de 93 uitgenodigden) aangegeven deel te willen nemen aan het PMO, waarvan er uiteindelijk 32 daadwerkelijk hebben deelgenomen (34%) en 30 van hen het evaluatieformulier hebben ingevuld. Bijna alle ziekenhuisartsen (91%) die hebben aangegeven deel te willen nemen, hebben daadwerkelijk de vragenlijst ingevuld en de biometrische onderzoeken ondergaan. Een ieder van deze ziekenhuisartsen is vervolgens bij de bedrijfsarts geweest voor een individuele terugkoppeling van de resultaten en, waar van toepassing, voor de daarbij behorende aanbevolen adviezen of interventies. Bijna altijd (92%) heeft de bedrijfsarts een advies of interventie gegeven wanneer dat op basis van de resultaten te verwachten was. De veronderstelde positieve bijdrage van deelname aan het PMO is genoemd als één van de succesfactoren. Als succesfactoren zijn verder de bereikbaarheid en flexibiliteit van de bedrijfsarts alsmede de heldere communicatie naar de ziekenhuisartsen genoemd. Daarentegen is met name de werkdruk van de assistente van de bedrijfsarts benoemd als een belemmerende factor. Het gebruik van een digitale vragenlijst is als suggestie genoemd om deze werkdruk te verlagen, omdat wordt verwacht dat de verwerking hiervan in vergelijking met een papieren vragenlijst minder tijdrovend is.

De proces evaluatie heeft inzicht gegeven in de acceptatie van het PMO: wordt een toekomstig PMO door alle belanghebbenden haalbaar en wenselijk geacht? Daartoe is de belanghebbenden gevraagd naar hun waardering van zowel het huidige PMO als een, indien wenselijk, toekomstig PMO en naar de intentie om in de toekomst aan het PMO deel te nemen (en/of dit te faciliteren, in het geval van de bedrijfsarts, zijn assistente en de leidinggevenden). De ziekenhuisartsen zijn zeer positief over zowel hun deelname aan het huidige PMO als de mogelijkheid eventueel in de toekomst deel te kunnen nemen aan een PMO (beiden werden gewaardeerd met een cijfer 8 op een schaal van 0-10). De meeste ziekenhuisartsen (93%) geven aan te willen deelnemen aan een eventueel in de toekomst aangeboden PMO. De hoofden van de drie betrokken medisch specialismen geven eveneens aan tevreden te zijn met de organisatie van het huidige PMO, maar het faciliteren van een PMO in de toekomst is minder zeker, omdat de lange termijn opbrengsten van het aanbieden van een PMO met betrekking tot de werk gerelateerde gezondheid en het werkvermogen hen nog niet overtuigen.
Tevens is aan alle ziekenhuisartsen gevraagd wat hun verwachtingen van het PMO zijn ten aanzien van de bijdrage die deelname aan het PMO kan leveren aan i) de algemene

gezondheid, ii) het werk functioneren en iii) het lange termijn werkvermogen. De meesten verwachten dat deelname aan het PMO bijdraagt aan de eigen gezondheid (83%), aan het werk functioneren (69%) en aan het werkvermogen op lange termijn (76%). Na het uitvoeren van deze haalbaarheidsstudie, is geconcludeerd dat het huidige beroepsspecifieke PMO voor ziekenhuisartsen haalbaar en geaccepteerd is.

4. Wat zijn zorgbehoeften van toekomstige ziekenhuisartsen?
Ondanks de positieve uitkomsten van het haalbaarheidsonderzoek, wordt de algemene houding van ziekenhuisartsen ten aanzien van de eigen zorgbehoeften en het eigen zorggedrag gezien als een mogelijk belemmerende factor in het succesvol en effectief uitrollen van het PMO in de toekomst. Om die reden is ook onderzocht hoe de toekomstige ziekenhuisartsen aankijken tegen de eigen zorgbehoeften en het eigen zorggedrag. Daartoe is een online vragenlijstonderzoek uitgezet onder medisch studenten, de toekomstige ziekenhuisartsen. Vragen gingen over hun huidige zorgbehoeften, in hoeverre zij zich op dit moment zorgen maken over hun gezondheid en hoe zij hun toekomstige zorgbehoeften inschatten. Er is ook onderzocht of er een relatie bestaat tussen de zorg over de eigen gezondheid op dit moment en het anticiperen op zorgbehoeften in de toekomst. Ofwel, als toekomstige ziekenhuisartsen zich op dit moment zorgen maken over hun gezondheidstoestand, geven ze dan ook aan in de toekomst behoefte te hebben aan zorg? Tenslotte is bij hen geïnformeerd naar de wijze en de locatie waarop zij de feedback op hun resultaten willen ontvangen, mocht hen in de toekomst een PMO worden aangeboden. De 647 deelnemers zijn verdeeld in drie groepen: medisch studenten in hun 3e of 4e jaar, medisch studenten die coschappen lopen (5e en 6e jaar) en net afgestudeerde basisartsen.

Een kwart van de toekomstige ziekenhuisartsen (27%) geeft aan zich op dit moment zorgen te maken over de huidige gezondheid, terwijl een grotere groep aangeeft behoefte te hebben aan zorg voor hun eigen huidige psychologische (42%) of fysieke (40%) klachten. Als toekomstige zorgbehoeften geeft de helft (52%) van de toekomstige ziekenhuisartsen aan deelname aan het PMO te overwegen wanneer dit aangeboden zou worden. Er is geen significant verband gevonden tussen het wel of niet zorgen maken over de gezondheidstoestand op dit moment en toekomstige zorgbehoeften. Ofwel, ondanks dat niet veel deelnemers zich zorgen maken over de huidige gezondheid, overwegen veel deelnemers in de toekomst wel deelname aan het PMO. Redenen om in de toekomst aan het PMO deel te nemen zijn de verwachte positieve bijdrage van deelname aan hun eigen en aan patiënt veiligheid, aan de kwaliteit van het werk en aan behoud en bevordering van de eigen gezondheid. Een klein deel (12%) overweegt niet deel te nemen, waarbij o.a. de angst voor eventuele consequenties van deelname voor het dienstverband als reden wordt benoemd.

Wanneer in de toekomst een PMO zou worden aangeboden, dan ontvangt het merendeel van de toekomstige ziekenhuisartsen de feedback op hun resultaten bij voorkeur per e-mail (54%) of via een consult bij de bedrijfsarts (51%). Het eigen opleidingsziekenhuis wordt door de meesten (68%) als voorkeurslocatie voor het ontvangen van de resultaten benoemd, gevolgd door de praktijk van een professional buiten het eigen ziekenhuis (34%).

Deze studie geeft aan dat er een grote behoefte is aan zorg op dit moment, ondanks dat men zich weinig zorgen maakt over de eigen huidige gezondheidstoestand. Dit reflecteert mogelijk een verschil tussen het enerzijds hebben van klachten en het anderzijds zorgen maken over deze klachten en de mogelijke negatieve consequenties voor anderen. Voorlichting en educatie over de mogelijke negatieve gevolgen van een verminderde gezondheid op het werk functioneren en patiënt veiligheid wordt daarom sterk geadviseerd.

Conclusies en aanbevelingen

In dit proefschrift is op basis van een wetenschappelijke onderbouwing een beroepsspecifiek PMO voor ziekenhuisartsen ontwikkeld. Dit PMO bestaat uit een onderzoek bij de Arbodienst, gevolgd door een individueel consult bij een bedrijfsarts ter bespreking van de resultaten en, indien van toepassing, het ontvangen van een advies of interventie. Op basis van de pilot-implementatie wordt geconcludeerd dat het PMO in deze vorm haalbaar en geaccepteerd blijkt.

Naar aanleiding van deze resultaten wordt aan de praktijk (Raden van Bestuur, hoofden van divisies/afdelingen en betrokken Arbodiensten) ten zeerste aanbevolen het beroepsspecifieke PMO voor ziekenhuisarts in te zetten als preventief instrument ter bewaking en bevordering van de gezondheid en het functioneren van ziekenhuisartsen, omdat het, naast aandacht voor de gezondheid van ziekenhuisartsen, een grote bijdrage kan leveren aan de kwaliteit van zorg en de patiëntveiligheid. Daarom wordt Raden van Bestuur tevens aanbevolen de gezondheid van artsen een indicator te laten zijn voor de algehele vaststelling van kwaliteit van zorg.

Een toenemende bewustwording van de mogelijk negatieve gevolgen van een verminderde gezondheid van de ziekenhuisarts op het leveren van kwaliteit van zorg is echter een vereiste om een en ander tot stand te doen komen. De onderwijskundigen die het medisch curriculum opstellen wordt derhalve geadviseerd deze bewustwording te stimuleren door het onderwerp expliciet te verwerken in het curriculum van medisch studenten. Vanwege het rolmodel dat ziekenhuisartsen die onderwijs geven vormen, wordt tevens geadviseerd strategieën te ontwikkelen die hen van dit rolmodel bewust maakt en hen ondersteunt in het bieden van goed onderwijs middels professioneel gedrag.

De Arbodiensten worden aangespoord om het PMO op bredere schaal te implementeren, waarbij wordt geadviseerd te onderzoeken in hoeverre de in het PMO opgenomen interventies in de praktijk daadwerkelijk bijdragen aan het verbeteren van de werk gerelateerde gezondheid en het werk functioneren van de ziekenhuisartsen op de langere termijn.

Wat betreft toekomstig onderzoek wordt geadviseerd bij grootschalige implementatie van het PMO te onderzoeken in hoeverre de in het PMO opgenomen wetenschappelijke onderbouwde adviezen en interventies daadwerkelijk bijdragen aan het behouden of vergroten van de werkgerelateerde gezondheid en het werk functioneren van artsen.

About the author

Curriculum vitae

M. (Martijn) Matthijs Ruitenburg was born on June 19th 1983 in Rhoon and grew up in Noordwijk and De Meern. He graduated from the Christelijk Gymnasium in Utrecht 2001, after which he started his study Human Movement Sciences at the Faculty of Human Movement Sciences at the VU University in Amsterdam. After graduating for his masters in 2008, he started the postmaster program to become an applied sport psychologist at Exposz / VU University.

During this postmaster program, Martijn worked at the Coronel Institutue of Occupational Health at the Academic Medical Center, Amsterdam. After a research project to investigate the occupational demands and health effects of several occupations of a Dutch railway company, Martijn got involved in the study to develop a job-specific workers' health surveillance for hospital physicians and evaluated the feasibility and acceptability with a pilot-implementation and evaluation, which finally resulted in this PhD thesis.

After finishing his postmaster program, Martijn started working as a fulltime sport psychologist at ProTask (Arnhem). When working with individuals and teams in sports, business and arts, he aims at providing these performers with the mental skills to reach their own best performance. He is also involved as a trainer in the project 'Mentale Kracht' of the Dutch National Police, where the basic principles of sport psychology form the basis to help police officers cope with stressors and reach their best performance under any circumstance.

Since 2015 Martijn is co-owner of Team MP, together with Pepijn Lochtenberg, working closely together with Coach2score. Together they aim to provide high-level and long term sport psychological services to the world of sports, business, arts and education.

Portfolio

PhD student:	M.M. Ruitenburg
PhD period:	January 2015 – August 2015
PhD supervisor:	Prof. dr. JK Sluiter / Prof. dr. MHW Frings-Dresen

PhD training

	Year	Workload	
Relevant courses during the Bachelor and (Post)Master		**Hours**	**ECTS**
Scientific Writing	2002/2003	168	6
Mathematics	2002/2003	168	6
Research Methods: Statistics	2002/2003	168	6
Research Methods: Data analyses	2003/2004	84	3
Research Methods: Measure of Physical Quantities	2003/2004	252	9
Research Methods: Computer Applications	2003/2004	84	3
Research Methods: Questionnaires and Motor Skills Tests	2003/2004	84	3
Presentation Skills	2003/2004	84	3
Test construction	2010/2011	168	6
General Courses			
Searching PUBMED	2010	10	0.4
Educational Skills Training	2015	10	0.4
Basic Course Legislation and Organization for Clinical Researchers (BROK) (no exam)	2015	28	1
Presentations			
Presentation research meeting Coronel Institute	2009	10	0.4
(Poster / Oral) Presentation SIG-dagen	2009	10	0.4
Oral presentation at Conference of International Commission on Occupational Health on Work Organisation and Psychosocial Factors (ICOH WOPS)	2010		
Poster Presentation BG-dagen		10	0.4
Presentation research meeting Coronel Institute	2011	10	0.4
Presentation research meeting Coronel Institute	2014	10	0.4
Presentation research meeting Coronel Institute	2015	10	0.4
Oral presentation at conference of European Association for Physician Health (EAPH)	2015	10	0.4
Workshop at conference of European Association for Physician Health (EAPH)	2015	10	0.4
(Inter)national conferences			
Conference of International Commission on Occupational Health on Work Organisation and Psychosocial Factors (ICOH WOPS)	2010	32	1.1
Conference of European Association for Physician Health (EAPH)	2015	18	0.6
2. Teaching			
'Writing a review' for Medical Students	2010	32	1.1
Guest lecturer Topsport, Beweging, Muziek	2014	10	0.4
Guest lecturer Topsport, Beweging, Muziek	2015	10	0.4
Total		1480	52.9

List of Publications

Articles related to this thesis

- Ruitenburg MM, Frings-Dresen MH, Sluiter JK. The prevalence of common mental disorders among hospital physicians and their association with self-reported work ability: a cross-sectional study. BMC Health Serv Res 2012;12:292-8.

- Ruitenburg MM, Frings-Dresen MH, Sluiter JK. Physical job demands and related health complaints among surgeons. Int Arch Occup Environ Health 2013;86(3):271-9.

- Ruitenburg MM, Frings-Dresen MH, Sluiter JK. How to define the content of a job-specific workers' health surveillance for hospital physicians? Safety and Health at Work; in press

- Ruitenburg MM, Plat MC, Frings-Dresen MH, Sluiter JK. Feasibility and acceptability of a workers' health surveillance program for hospital physicians. Int J Occup Med Environ Health 2015;28(4):731-9.

- Ruitenburg MM, Frings-Dresen MH, Sluiter JK. Current and future health care needs of medical students and young hospital physicians. Occupational Medicine; in press

Reports related to this thesis

- Ruitenburg MM, Plat MJ, Frings-Dresen MWH, Sluiter JK. Healthy at the job for hospital physicians: development and pilot-implementation of a worker's health surveillance (in Dutch: Gezond (blijven) werken voor medisch specialisten (in opleiding): ontwikkeling en pilot-implementatie van een preventief medisch onderzoek) Amsterdam: Coronel Institute of Occupational Health, Academic Medical Center, report number 12-01, 2012.

- Ruitenburg MM, Plat MCJ, Frings-Dresen MHW, Sluiter JK. Pilot-implementation of a job-specific workers' health surveillance for hospital physicians (in Dutch: Pilot-implementatie van een beroepsspecifiek preventief medisch onderzoek voor medisch specialisten (i.o.)) Amsterdam: Coronel Institute of Occupational Health, Academic Medical Center, report number 12-03, 2012.

Other articles and reports

- Botje D, Zoer I, Ruitenburg MM, Frings-Dresen MH, Sluiter JK. On-site observations of physical work demands of train conductors and service electricians in the Netherlands. Ergonomics 2010;53(8):1016-23.

- Zoer I, Ruitenburg MM, Botje D, Frings-Dresen MH, Sluiter JK. The associations between psychosocial workload and mental health complaints in different age groups. Ergonomics 2011;54(10):943-52.

- Ruitenburg MM, Zoer I, Frings-Dresen MHW, Sluiter JK. Workload for service employees, train drivers, train conductors, and service electricians at the Netherlands railway company. Summary Report. (in Dutch: Werkbelasting servicemedewerkers, machinisten, conducteurs en monteurs bij NS. Samenvattingsrapport) Amsterdam: Coronel Institute of Occupational Health, Academic Medical Center, report number 09-01, 2009.

- Ruitenburg MM, Zoer I, Frings-Dresen MHW, Sluiter JK. Workload for service employees, train drivers, train conductors, and service electricians at the Netherlands railway company: current situation and possible solutions. (in Dutch: Werkbelasting servicemedewerkers, machinisten, conducteurs en monteurs bij NS: stand van zaken en mogelijke oplossing) Amsterdam: Coronel Institute of Occupational Health, Academic Medical Center, report number 08-7, 2009.

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