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## Original Article

# How to Define the Content of a Job-Specific Worker's Health Surveillance for Hospital Physicians?



Martijn M. Ruitenburg, Monique H.W. Frings-Dresen, Judith K. Sluiter\*

Coronel Institute of Occupational Health, Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands

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## ABSTRACT

**Background:** A job-specific Worker's Health Surveillance (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.

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## 1. 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 required by legislation to periodically offer a WHS to its employees. In a collective agreement the employer and a labor-union can make additional agreements on the frequency and timing of offering a WHS. While the employer is

\* Corresponding author. Coronel Institute of Occupational Health, Academic Medical Center, University of Amsterdam, P.O. Box 22700, 1100 DE Amsterdam, The Netherlands.

E-mail address: [j.sluiter@amc.uva.nl](mailto:j.sluiter@amc.uva.nl) (J.K. Sluiter).

responsible for financing the WHS, an independent occupational health service is primarily responsible for the content and organization of the WHS, which also includes keeping records of the data. Participation of the employee is voluntary.

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 advice or recommendations on an organizational 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-centered 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 International Labor Organization (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]. 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 questions of what steps should be taken to arrive at a job-specific WHS and what the content of a job-specific WHS for hospital physicians should be are addressed.

## 2. Materials and methods

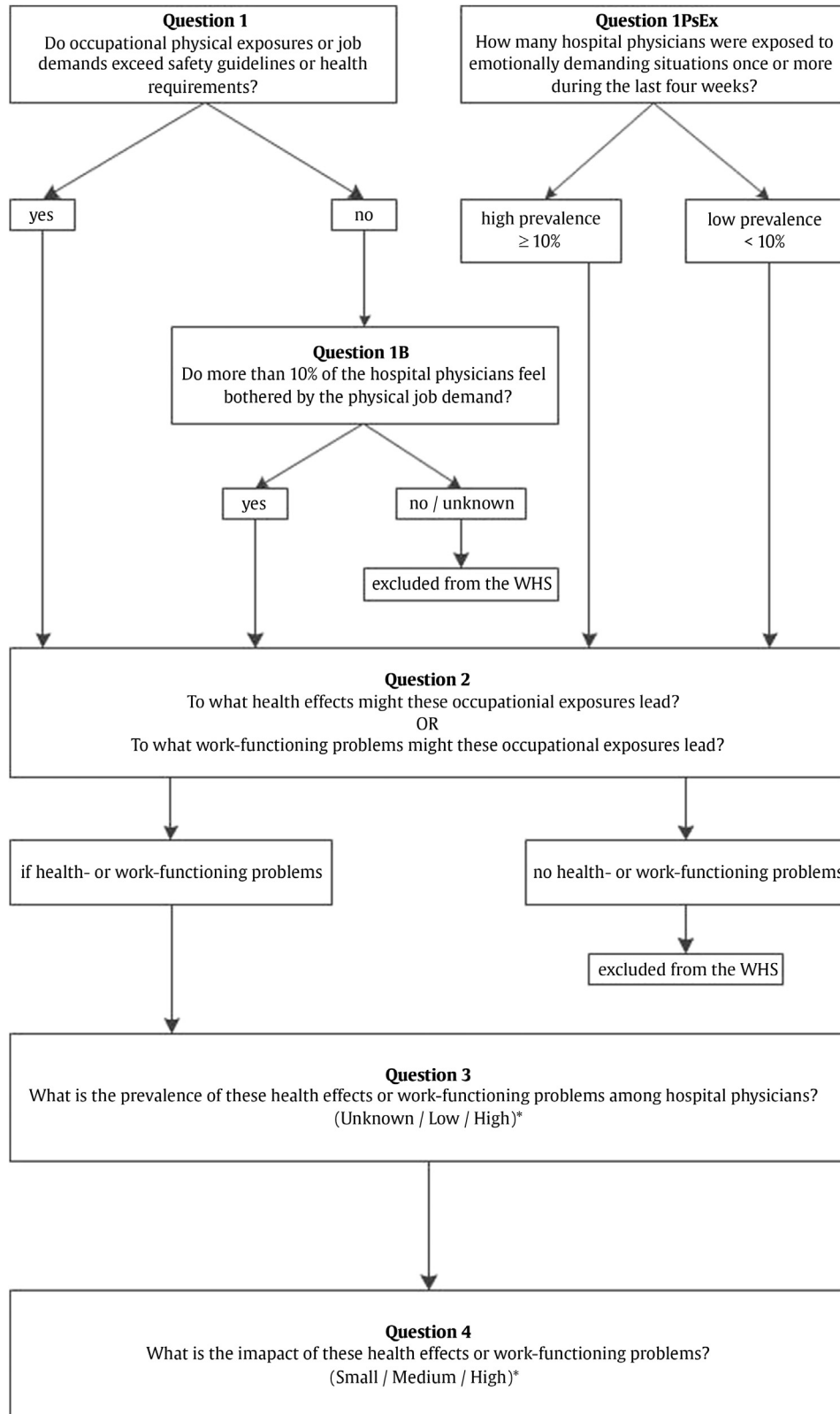
To determine the content of the job-specific WHS for hospital physicians, a decision tree was developed based on answers to four

questions (Fig. 1). Subdecision 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 1 of the decision tree could be answered (Fig. 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: (1) observational medical specialties (e.g., Internal Medicine); (2) supportive (e.g., Radiology), and (3) 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 chemical and physical exposure was obtained through international evidence [17]. Once the occupational physical exposures and job demands were identified, they were compared with the guidelines of occupational exposures and job demands, e.g., with Dutch guidelines of occupational exposures and job demands (Fig. 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 (Fig. 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 inclusion or exclusion in the WHS. Data that were needed to answer questions 1B and 1PsEx (Fig. 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 (Fig. 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 evaluated 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 with the general population.

To answer the fourth research question (Fig. 1), our expert group of researchers identified three aspects to decide upon the impact of the specific health- or work functioning problem: (1) whether it bothered the individual worker; (2) whether it led to restrictions in daily work functioning; and (3) whether it posed a potential risk for others. When hardly bothering the individual, hardly restricting daily work function and posing no risk for others, the impact was considered small. The impact was labeled as medium when the health effect was bothering the individual in some way, but was not restrictive in daily work functioning or posing a risk for others.



\*see explanation on page 6

Fig. 1. Decision tree for occupational exposures and job demands with stepwise question checking. WHS, Worker's Health Surveillance.

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 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.

### 3. 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: (1) the prevalence of the health- or work-functioning-effect was high and the impact medium or big; or (2) 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: (1) prevalence of the emotionally demanding situation was high and the impact medium or big; (2) 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 (3) 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.

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 unaddressed health problems that might affect their work ability. An overview of the WHS protocol is shown in Table 2.

After the job-specific demands, exposures and health- or work-functioning problems were selected that needed to be included in the WHS and 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

**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?
<b>Physical job demands</b>						
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
<b>Physical job requirements</b>						
Sufficient vision	Yes	-----▶	Work-functioning problems due to reduced sight	-----▶	High	Yes
<b>Biological/chemical exposure</b>						
Biological agents	Yes	-----▶	Hepatitis B HIV Diarrhea, etc.	Unknown	High	Yes
Halothane in OR	Yes	-----▶	Irritation of skin, eyes and/or respiratory tract	Unknown	High	Yes
Benzene	No	Unknown	-----▶			No
<b>Psychological job demands</b>						
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 4 wk)	High prevalence (26%)	-----▶	Stress Burnout	High (15) Low (6)	High	Yes

OR, operation room; VDU, visual display unit; WHS, Worker's Health Surveillance.

**Table 2** Topic list and measurement protocol of the job-specific Worker's Health Surveillance (WHS) for hospital physicians

	Aspect of job requirement or job demand to be included in WHS	Instrument used in WHS (Written signaling question/validated screener/validated test/direct measurement)	Outcome measures	Signal when:
Physical job requirements Musculoskeletal system Neck flexion and rotation Standing Sitting Computer work Fine motor skills	Neck complaints Lower back complaints Shoulder complaints Hand/wrist complaints	Signaling question "Did you experience recurrent and/or prolonged complaints in [body region] during the last 6 mo?"	yes/no	Outcome is "yes"
	Problems with vision	If yes, do you feel impaired in executing your work because of this complaint? (yes/no) Signaling question [20,21] "Do you have trouble reading during your work?"	yes/no	Outcome is "yes"
	Sufficient hearing	Vision test [20,21] Landolt C rings, distance 40 cm and 60 cm (both eyes together; if job demand includes using only one eye, also eyes separately) Signaling question "Do you have trouble hearing during your work?"	Eyes together Left eye Right eye yes/no	Outcome is "yes" or score vision test < 0.8
		Hearing test [22] Whisper test – 6 combinations per ear	No. of errors per ear (range, 0–6)	Outcome is "yes" or number of errors whisper test per ear > 4
Physical job demands Exposure of skin to solid or liquid substances Risk of infectious diseases	Work-related skin complaints (e.g., contact dermatitis)	Signaling question "Do you currently experience skin complaints on arms or hands?"	yes/no	Outcome is "yes"
	Experiencing bite- or needle stick-accident Exposure to body material	Signaling question "Have you recently (during the last four wk) experienced a bite- or needle stick-accident?" "Have you recently (during the last four wk) been exposed to body material of patients?" "Do you currently have an infectious disease?"	yes/no yes/no yes/no	Outcome is "yes" Outcome is "yes" Outcome is "yes"
	Presence of infectious diseases that pose a risk to others Work-related complaints of lungs or respiratory tract (e.g., COPD or asthma)	Signaling question "Do you currently experience complaints with your respiratory tracts or lungs?"	yes/no	Outcome is "yes"
	Recently experienced aggression	Signaling question "Did you recently experience.... ... aggression from a patient towards yourself or a colleague? ... aggression from a colleague or supervisor towards yourself?" "Did you recently experience.... ... a severe traumatic incident?"	yes/no yes/no yes/no	Outcome is "yes" Outcome is "yes" Outcome is "yes"
Psychological job demands Emotionally demanding situations	Recently experienced trauma	Screening question "Did you recently experience.... ... aggression from a patient towards yourself or a colleague? ... aggression from a colleague or supervisor towards yourself?" "Did you recently experience.... ... a severe traumatic incident?"	yes/no	Outcome is "yes"
	PTSD	Screening: Dutch Impact of Event Scale (SVL) [23,24] Signaling question "Do you use drugs?" (yes/no)	Score 0–75	Score ≥ 20
Psychological job requirements Alertness and judging ability	Drug use	If yes, which? -Painkillers -Tranquilizers -Sleeping aids -Other...	yes/no	Outcome signaling question is "yes"
			yes/no	Outcome signaling question is "yes"

Sleepiness	Screener: Epworth Sleepiness Scale [25]	Score 0–24	Score $\geq 10$
Alcohol consumption	Screener: AUDIT–C [26]	Score 0–12	Men: score $\geq 5$ Women: $\geq 4$ Score $\geq 4$
Depressive symptoms	Screener: GHQ–12 [27]	Score 0–12	Score $> 5$
Anxiety symptoms	Screener: Need for Recovery after work scale [28–30]	Score 0–11	Score $\leq 5$
Stress symptoms	Screener: Work Ability Index – first item [score 0 (lowest ever) – 10 (highest ever)] [19,31]	Score 0–10	Score $\leq 5$
Work-related fatigue	Signaling 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”
Current self-reported work ability	Signaling question “Does/did your father, mother, brother or sister have.... ...diabetes type 2?” ...have a cardiovascular disease before age 65?” “Do you smoke?”	yes/no yes/no yes/no cm’s	Yes: 4 Yes: 1 Yes: 9 $\geq 94$ cm: 3
Other prevalent health effects	Measurement BMI = Weight/(Length $\times$ length)	Weight (kg), Length (m), BMI	25 – < 30: 4 $\geq 30$ : 12 Male < 45: 0 45–49: 13 50–54: 17 $\geq 55$ : 23 Total points < 30 with risk factor OR total points $\geq 35$
	Written question	Age (y)	25 – < 30: 4 $\geq 30$ : 7 Female < 45: 0 45–49: 10 50–54: 16 $\geq 55$ : 23 Total points < 30 with risk factor OR total points $\geq 35$
	Measurement	Systolic blood pressure	$\geq 140$ mmHg
Systolic and diastolic blood pressure	Digital blood pressure reading (3 times) [32]	Diastolic blood pressure	$\geq 90$ mmHg

Risk factors cardiovascular diseases  
Risk profile

Points for summing Dutch CVD risk profile  
Male  
Female

AUDIT–C, Alcohol Use Disorders Identification Test–Consumption; BMI, body mass index; COPD, chronic obstructive pulmonary disease; CVD, cardiovascular disease; GHQ, General Health Questionnaire; PTSD, post-traumatic stress disorder.

**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	<p>Signaling question “yes”, no impairment during work</p> <p>Signaling question “yes” and impairment during work</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss relevant tasks and activities within medical specialty of employee</li> <li><input type="checkbox"/> Inquire about nature, origin and development of current complaints and possible impairments [33]</li> <li><input type="checkbox"/> Consider referral to general practitioner or specialized consultant</li> <li><input type="checkbox"/> If work-related complaints, arrange for occupational disease notification</li> <li><input type="checkbox"/> In the case of reduced personal capacity, advise specific exercises to increase personal capacity [33]</li> <li><input type="checkbox"/> Follow up within 6 wk</li> <li><input type="checkbox"/> Discuss relevant tasks and activities within medical specialty of employee</li> <li><input type="checkbox"/> Inquire about nature, origin and development of current complaints and possible impairments [34]</li> <li><input type="checkbox"/> In the case of shoulder- or hand/wrist-complaints due to excessive computer use: advise micro-breaks [35]</li> <li><input type="checkbox"/> In the case of complaints due to other tasks: discuss impairments in work and discuss possibilities of adjustments in organization of work and work environment [34]</li> <li><input type="checkbox"/> If work-related complaints, arrange for occupational disease notification</li> <li><input type="checkbox"/> Follow up within 6 wk</li> <li><input type="checkbox"/> If tasks performed with 1 eye: measure eyes separately</li> <li><input type="checkbox"/> If reduced vision for 60 cm, consider advising screen glasses</li> <li><input type="checkbox"/> Refer to optician</li> <li><input type="checkbox"/> Follow up within 4 wk</li> <li><input type="checkbox"/> Discuss impairments during meetings or other activities</li> <li><input type="checkbox"/> Make tone audiogram or perform test with computer of audiological center (silence required)</li> <li><input type="checkbox"/> Follow up within 4 wk</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss task, activities and work –rest schedule</li> <li><input type="checkbox"/> In the case of impairments in work, advise to discuss outcome with manager</li> </ul>
Neck, shoulder or hand/wrist complaints	<p>Signaling question “yes”, no impairment during work</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> In the case of computer work: consider advising support for hand/wrist [35]</li> <li><input type="checkbox"/> In the case of complaints due to use of mouse: advise switching arms or advise alternative mouse [35]</li> <li><input type="checkbox"/> In the case of mainly sitting work at workplace, discuss workplace investigation by ergonomist [35]</li> <li><input type="checkbox"/> In the case of noncomputer related complaints: discuss impairments in work and investigate possible ergonomic interventions</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss task, activities and work –rest schedule</li> <li><input type="checkbox"/> In the case of impairments in work, advise to discuss outcome with manager</li> </ul>
Sufficient vision	<p>Signaling question “yes” or vision test &lt; 0.8</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Advise to get hearing aid</li> <li><input type="checkbox"/> Refer to ENT doctor or audiologist if results suggest this</li> <li><input type="checkbox"/> When program for hearing protection seems applicable: use guideline for Preventive Occupational Hearing reduction [36]</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> In the case of impairments in work, advise to discuss outcome with manager</li> </ul>
Sufficient hearing	<p>Signaling question “yes” or &gt;4 errors for 1 ear</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Advise personal protection resources</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> 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)</li> </ul>
Physical exposures Exposure of skin to solid or liquid substances	<p>Signaling question “yes”</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Inquire about current complaints and impairments</li> <li><input type="checkbox"/> Discuss possible causes</li> <li><input type="checkbox"/> Consider specialized interventions</li> <li><input type="checkbox"/> If work-related complaints, arrange for occupational disease notification and use the registration guideline</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Explore possibilities of reducing exposure</li> <li><input type="checkbox"/> 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)</li> </ul>

<p>Risk of infectious diseases</p>	<p>Signaling question "yes"</p>	<p>"Occupational contact dermatoses" [37]</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> In the case of contact eczema: investigate reduction of exposure to skin irritating factors, advise skin protection, skin cleaning and skin moisturizing [38]</li> <li><input type="checkbox"/> Follow up within 4 wk</li> <li><input type="checkbox"/> Strategy to carry out is dependent on infectious disease, use hospital-specific guideline "Hospital workers and infectious diseases"</li> <li><input type="checkbox"/> Discuss influence on work functioning</li> <li><input type="checkbox"/> Discuss whether "PEP protocol" for needle stick-, bite- or sex-accidents was followed, inclusive of testing. When necessary, advise additional actions</li> <li><input type="checkbox"/> Check current complaints and subsequent impairments and investigate work-relatedness</li> <li><input type="checkbox"/> If work-related complaints, arrange for occupational disease notification</li> <li><input type="checkbox"/> Consider specialized interventions</li> <li><input type="checkbox"/> In the case of regular or chronic exposure to dust, smoke and vapor (smoking included): consider additional research for early diagnosis of COPD [39]</li> <li><input type="checkbox"/> In the case of COPD, choose possible interventions: stop smoking, adjustment of work/working schedule, reduced inhaling exposure, lung recovery [39]</li> <li><input type="checkbox"/> Decide whether it is a case of asthma: does the employee experience complaints of respiratory tracts or lungs in combination with dyspnea, 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]</li> <li><input type="checkbox"/> Follow up within 4 wk</li> </ul>
<p>Needle stick- or bite-accident</p>	<p>One or both signaling question "yes"</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> When necessary, prescribe suitable medication</li> <li><input type="checkbox"/> Consider resources or inhaler</li> <li><input type="checkbox"/> Explore possibilities of reducing exposure</li> <li><input type="checkbox"/> In the case of impairments in work, advise employee to discuss outcome with manager</li> </ul>
<p>Exposure of respiratory tracts or lungs to dust, smoke, gas, or vapor</p>	<p>Signaling question "yes"</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Check current complaints and subsequent impairments and investigate work-relatedness</li> <li><input type="checkbox"/> If work-related complaints, arrange for occupational disease notification</li> <li><input type="checkbox"/> Consider specialized interventions</li> <li><input type="checkbox"/> In the case of regular or chronic exposure to dust, smoke and vapor (smoking included): consider additional research for early diagnosis of COPD [39]</li> <li><input type="checkbox"/> In the case of COPD, choose possible interventions: stop smoking, adjustment of work/working schedule, reduced inhaling exposure, lung recovery [39]</li> <li><input type="checkbox"/> Decide whether it is a case of asthma: does the employee experience complaints of respiratory tracts or lungs in combination with dyspnea, 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]</li> <li><input type="checkbox"/> Follow up within 4 wk</li> </ul>
<p>Psychological exposures Emotionally demanding situations Traumatic experience</p>	<p>Signaling question on traumatic experience "yes"</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Check the score on the Impact of Event Scale (see below)</li> <li><input type="checkbox"/> Discuss the item and consider advising the module "Resilience" on <a href="http://www.physicianhealth.com">www.physicianhealth.com</a> [40]</li> </ul>

(continued on next page)



Table 3 (continued)

Physical job requirements		Intervention choice based on:	
Outcome	Personal abilities/capacity	Measures/medication	Individual–work interaction
Aggression	<p>"Yes" on one or both signaling questions on experienced aggression in work</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> When related psychological complaints are also present, consider arranging for occupational disease notification</li> <li><input type="checkbox"/> In the case of work-related aggression, refer to <a href="http://www.physicianhealth.com">www.physicianhealth.com</a> [40], module "Disruptive behavior" or module "Resilience"</li> <li><input type="checkbox"/> Inquire whether appropriate care was delivered right after the incident</li> <li><input type="checkbox"/> Consider giving the employee "Aggression composure and handling" or "Aggression and Violence, relief and after care" brochures</li> <li><input type="checkbox"/> Consider training and counseling</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> If accompanied by depressive complaints, discuss use of drugs (see depression guideline NVAB) [41]</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> In the case of impairments in work, advise employee to discuss outcome with manager</li> </ul>
Individual's psychological resources Alertness and judging ability	<p>Score Impact of Event Scale [23]: 20–25 and Score &gt; 25</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> If work-related complaints, arrange for occupational disease notification</li> <li><input type="checkbox"/> Consider advising to use <a href="http://www.physicianhealth.com">www.physicianhealth.com</a> [40] and follow the "Resilience" module to reduce general stress complaints.</li> </ul> <p>Score 20–25</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Take note of the experienced trauma</li> <li><input type="checkbox"/> Discuss whether a one-time coaching or counseling session is desired</li> <li><input type="checkbox"/> Follow up within 4 wk</li> </ul> <p>Score &gt; 25</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss whether coaching or counseling is desired</li> <li><input type="checkbox"/> In the case of severe PTSD, advise therapy (cognitive-behavioral therapy, EMDR or Imaginary Exposure)</li> <li><input type="checkbox"/> In the case of severe PTSD, check for depression</li> <li><input type="checkbox"/> Make a follow-up appointment</li> <li><input type="checkbox"/> Discuss current drug use and potential influence on work functioning</li> <li><input type="checkbox"/> Consider advising <a href="http://www.physicianhealth.com">www.physicianhealth.com</a> [40] and the use of "Substance use" module</li> <li><input type="checkbox"/> In the case of addiction, refer to specialized clinic</li> <li><input type="checkbox"/> Arrange for follow-up appointment by phone within 6 wk</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> If accompanied by depressive complaints, discuss use of drugs (see depression guideline NVAB) [41]</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> In the case of impairments in work, advise employee to discuss outcome with manager</li> </ul>
Drug use	<p>Signaling question "yes"</p>		

Sleepiness	Score Epworth Sleepiness Scale [25] ≥ 10	Score 10–15	Score 10–15	Score 10–15
Alcohol consumption	AUDIT-C [26] score: Male ≥ 5 Female ≥ 4	<ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss situational causes</li> <li>Score &gt; 15</li> <li><input type="checkbox"/> Consider specialized consult (sleeping expert) and arrange for follow-up appointment</li> <li><input type="checkbox"/> Discuss outcome in relation to health risks and patient safety</li> <li><input type="checkbox"/> Consider advising the “Substance use” module on <a href="http://www.ephysicianhealth.com">www.ephysicianhealth.com</a> [40]</li> <li><input type="checkbox"/> Consider advising autonomous intake reduction by using the free online course “Drinking less” [42]</li> <li><input type="checkbox"/> 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]</li> <li><input type="checkbox"/> In the case of addiction, refer to specialized clinic</li> <li><input type="checkbox"/> Arrange for follow-up appointment by phone within 6 wk</li> <li><input type="checkbox"/> If work-related complaints, arrange for occupational disease notification</li> <li><input type="checkbox"/> Consider to advise using <a href="http://www.ephysicianhealth.com">www.ephysicianhealth.com</a> [40] to run through the “Resilience” module to reduce general stress complaints</li> <li><input type="checkbox"/> When GHQ-score ≥4, following actions include:                             <ul style="list-style-type: none"> <li>Step 1: employee fills out additional validated questionnaires specifically for depressive- (BSI-DEP [44]) and anxiety (BSI-ANG [44]) symptoms</li> <li>Step 2a: in the case that one or both scores &gt; 0.41:                                     <ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss possible causes of complaints</li> <li><input type="checkbox"/> Consider specialized interventions</li> <li><input type="checkbox"/> Assess the psychosocial work environment [45]</li> <li><input type="checkbox"/> In the case of first, mild depressive symptoms, consider giving education, psycho-education or an online self-help course “Color your life”, or problem-solving therapy and regular control (national depression guideline [41]) and arrange for follow-up appointment within 6 wk</li> <li><input type="checkbox"/> Consider a combination of cognitive –behavioral interventions and relaxation in the case of depressive complaints [45]</li> <li><input type="checkbox"/> Arrange for follow-up appointment within 6 wk</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss temporary adjustments in work</li> <li>Score &gt; 15</li> <li><input type="checkbox"/> In the case of impairments in work, advise employee to discuss outcome with manager and advise dayshifts temporarily</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss temporary adjustments in work content</li> <li><input type="checkbox"/> In the case of impairments in work, advise employee to discuss outcome with manager</li> </ul>
Depressive, anxiety and/or stress symptoms	Score GHQ-12 [27]: ≥ 4	<ul style="list-style-type: none"> <li><input type="checkbox"/> Consider after diagnosis, medication and/or treatment or therapy according to national guideline [41]</li> <li><input type="checkbox"/> When increasing personal abilities by specialized interventions does not result in any effects within 6 wk, with a mild to average depression for a period longer than 3 mo 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])</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss temporary adjustments in work</li> <li><input type="checkbox"/> In the case of impairments in work, advise employee to discuss outcome with manager</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss temporary adjustments in work</li> <li><input type="checkbox"/> In the case of impairments in work, advise employee to discuss outcome with manager</li> </ul>

(continued on next page)

Table 3 (continued)

Physical job requirements		Intervention choice based on:
Outcome	Personal abilities/capacity	Measures/medication
	<p>Step 2b: in the case of none of the scores &gt; 0.41:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss causes of complaints</li> <li><input type="checkbox"/> Support when necessary in taking recovery steps by simple cognitive –behavioral interventions, e.g. offering a rational perspective, daily structures, positive restructuring [46]</li> <li><input type="checkbox"/> Enhance problem-solving abilities of the employee, manager and assess the interaction between both [46]</li> <li><input type="checkbox"/> Discuss influence of fatigue on work –life balance</li> <li><input type="checkbox"/> Discuss recovery opportunities [29] during the workday</li> <li><input type="checkbox"/> Advise using the “Burnout” module on <a href="http://www.ephysicianhealth.com">www.ephysicianhealth.com</a> [40] to prevent burnout or the “Resilience” module</li> <li><input type="checkbox"/> In the case of severe complaints, consider using the Maslach Burnout Inventory [47] and arrange for occupational disease notification when:</li> </ul>	<p>Individual–work interaction</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Consider organization interventions proposed by Dunn et al (2007) [49] to improve work–life balance:               <ul style="list-style-type: none"> <li>- when possible, adjust the work to the aim of the hospital physician</li> <li>- Discuss the possibility of flexible working schedule</li> <li>- Discuss possibilities to put more emphasis on the interests of the hospital physician</li> <li>- Temporary reduction of the administrative tasks</li> </ul> </li> <li><input type="checkbox"/> In the case of impairments in work, advise to discuss outcome with manager</li> <li><input type="checkbox"/> Discuss risk factors of workload (time pressure, deadlines, quantity of work), recovery opportunities, work –rest balance, social relationships.</li> </ul>
Work-related fatigue	Score VBBA scale “Need for recovery” [30] > 5	
Work ability	When score first item of Work Ability Index [19] ≤ 5	<ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss situational causes</li> <li><input type="checkbox"/> Discuss influence on work functioning and work–life balance</li> <li><input type="checkbox"/> Investigate causes of reduced individual capacities and start suitable interventions to increase work ability</li> <li><input type="checkbox"/> Advise employee to have a solution-orientated conversation with their manager</li> <li><input type="checkbox"/> Arrange for follow-up appointment within 6 wk</li> <li><input type="checkbox"/> Discuss health complaint and influence on work functioning</li> </ul>
Other health aspects in relation to work	Signaling question “yes”	
Cardiovascular diseases	Orange	
Calculate score risk profile	<p>Male: score risk profile &lt; 30 with risk factor smoking or obesity</p> <p>Female: score risk profile &lt; 35 with risk factor smoking or obesity</p>	<p>Age &lt; 45 Y:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> When risk factors are present, give targeted lifestyle advices or, when risk factors are absent, give generic lifestyle advice (using <a href="http://www.testuwleefstijl.nl">www.testuwleefstijl.nl</a>) [50] and/or refer to the “Weight, nutrition and fitness” module on <a href="http://www.ephysicianhealth.com">www.ephysicianhealth.com</a>.</li> </ul>

Employees currently having diabetes or cardiovascular diseases:

- Discuss whether there are impairments in work
- Discuss whether the employee is currently under specialized control

Orange:

- Give lifestyle advice targeted at the risk factors present and/or refer to [www.ephysicianhealth.com](http://www.ephysicianhealth.com) [40] to follow the “Weight, nutrition and fitness” module.

Red:

- Discuss results and give lifestyle advice
- 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, obesity, quit smoking, LTA chronic kidney damage
  - When accessible, use NVAB “Healthy nutrition and exercising in the workplace” guideline [51]

Continuing for heart- and coronary-diseases

Red:

Male: score risk profile  $\geq 30$   
 Female: score risk profile  $\geq 35$   
 and/or  
 employee currently having diabetes or cardiovascular diseases

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AUDIT-C, Alcohol Use Disorders Identification Test-Consumption; COPD, Chronic obstructive pulmonary disease; CVRM, Cardiovascular Risk Management; DM2, Diabetes Mellitus Type 2; EMDR, eye movement desensitization and reprocessing; ENT, ear, nose, throat; GHQ, General Health Questionnaire; LTA, National Transmural Appointment (in Dutch: Landelijke Transmurale Afspraak); NVAB, The Netherlands Society of Occupational Medicine (in Dutch: Nederlandse Vereniging voor Arbeids- en Bedrijfsgezondheidskunde); PEP, postexposure prophylaxis; PTSD, post-traumatic stress disorder; VBBA, Vragenlijst Beleving en Beoordeling van de Arbeid (Dutch: The Dutch questionnaire on the experience and assessment of work).

consist of (ergonomic) measures or medication or act on the individual organization 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, e.g., guidelines of the Netherlands Society of Occupational Medicine (NVAB). An overview of the interventions proposed for each possible signal is shown in Table 3.

#### 4. 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 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 counseling 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 behavior, 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 diminished 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 program 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 program 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 organization 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.

#### Conflicts of interest

The authors have no conflicts of interest to declare.

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