

# Is it possible to improve compliance in hypertension and reduce therapeutic inertia of physicians by mandatory periodic examinations of workers?

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## Abstract

**Background:** Due to high prevalence, insufficient recognition, and ineffective treatment, hypertension (HT) still remains a major medical and socio-economic problem. There is a real necessity to develop effective prophylaxis for cardiovascular disorders (CVD), based on strategies that support compliance during long-term therapy. The Polish scheme of occupational health services with mandatory periodical employee check-ups creates a unique opportunity for effective HT prophylaxis. As a result, visiting a doctor is required not only due to health ailments but also by law, which is especially important for those feeling well. It enables an improvement in tertiary prevention, including actions taken not only by the doctors of the occupational health services, but also by the physicians in charge of treating the patients.

**Aim:** Evaluation of the usefulness of mandatory health check-ups of employees concerning frequency of diagnosis and improvement of treatment outcomes of HT.

**Methods:** The study group comprised 1010 Polish workers referred by their employers for mandatory medical examinations. All of the study participants filled in a questionnaire focused on self-assessment of their health, current blood pressure (BP) measurements, and in cases where HT had been previously detected — compliance with medical recommendations. Then in the doctor's office BP measurements were taken twice. Workers who fulfilled a criterion indicating a need for intervention were educated on optimal diet, physical activity, and risk factors for CVD. They also received medical instructions for three-step action. The first recommendation: measure BP three times a day for one week and record the results. The second: visit a general practitioner (GP) for a professional assessment of those results. The third: re-visit the occupational health physician within three months. The criterion for intervention was prior HT and a mean of two BP measurements  $\geq 180/110$  mmHg — in each case, or  $\geq 140/90$  mmHg — in the case of occupational exposure to risk factors for CVD.

**Results:** The mean age of the study participants was 41.7 years (similar in both genders). A previous diagnosis of HT was declared by 20.1% of patients. 11% of patients involved in the intervention did not comply with medical advice. The current HT therapy of all of the subjects with HT (100% of those with abnormal BP, who visited their GP) was modified.

**Conclusions:** Prophylactic medical check-ups of workers gives improved compliance and medical surveillance of HT in patients with an uncontrolled clinical course of this disease. Obligations and periodic examinations encourage both patients and physicians to improve compliance and reduce the risk of therapeutic inertia.

**Key words:** prophylaxis, compliance, therapeutic inertia, occupational health service, uncontrolled hypertension

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## INTRODUCTION

Hypertension (HT), as one of the main risk factors of cardiovascular disorders (CVD), remains a baffling unsolved medical, social, and economic issue due to high, long-term prevalence and insufficient control [1, 2]. Available epidemiological studies have indicated that HT is a worldwide problem, with often undetected HT and unsatisfactory therapy outcomes [3, 4]. There is a real necessity to develop effective prophylaxis in CVD, especially based on strategies supporting compliance during long-term therapy between the patient and the physician in charge of treatment [5]. When seeking efficient organisational solutions, it is worth focusing on current national programmes implemented and working in the health care sector. The Polish scheme of occupational health services with mandatory periodic employee check-ups offers a unique opportunity for effective HT prophylaxis because it enforces the disease's control. As a result, visiting a doctor is not only necessary to treat health ailments but is also required by law, which is especially important for those feeling well, who are unaware of their health problems. Approximately four million mandatory employee examinations are carried out yearly in Poland within a population of over 12.5 million at an economically productive age [6]. The cyclicality of these check-ups lawfully set by the Polish Labour Code [7] allows a physician to oblige a worker to return for another obligatory health check in a reduced period of time. It enables improvements to tertiary prevention, including actions taken not only by doctors of the occupational health services, but also by physicians in charge of treating the patients in general practices and other specialists involved in the diagnostic-therapeutic process.

The aim of this study was to evaluate of the usefulness of mandatory health check-ups of employees concerning frequency of diagnosis and improvement of treatment outcomes of HT.

## METHODS

The study group comprised 1010 workers referred by employers for mandatory medical examinations (preliminary, periodic, or control) between February–July 2015. Medical check-ups were carried out in the occupational medicine outpatient clinic located in a city in central Poland with a population of 60,000 inhabitants.

All of the study participants filled in a questionnaire focused on self-assessment of their health, current blood pressure (BP) measurements, and in cases where HT had been previously diagnosed — compliance with medical recommendations. Information about occupational exposure was obtained from the referral for examination issued by employers. Occupational risk factors for CVD were considered to be: work involving high-intensity physical activity, shift-work, a prolonged work-day, sedentary work, occupational stress, a cold and hot microclimate, and noise [8–11].

All of the patients had their BP measurement taken twice during the visit. Workers with previously diagnosed HT and a high BP measurement during the obligatory prophylactic examination received information regarding the necessity of systematic ambulatory control of BP and compliance with the treatment prescribed by their managing physician (general practitioner [GP] or cardiologist, etc.).

The criterion for implementation of intervention was a prior HT diagnosis and a mean of two BP measurements of  $\geq 180/110$  mmHg (third grade HT [12, 13]) — in each case, or  $\geq 140/90$  mmHg (first grade HT [12, 13]) — in case of occupational exposure to risk factors for CVD development.

The subjects who fulfilled a criterion indicating a need for intervention were educated on optimal diet and physical activity and risk factors for the development of cardiovascular diseases in addition to receiving medical instructions for the following actions:

- take BP measurement three times a day (in the morning, the middle of the day, and in the evening) over the following seven days; record those results in a table;
- visit your GP for professional assessment of those results and possible implementation/modification of HT therapy;
- re-visit an occupational health physician in a shorter period than the next mandatory prophylactic medical check-up within three months.

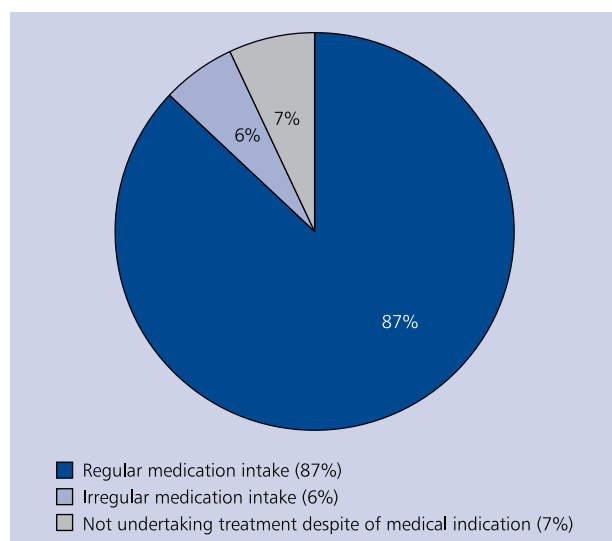
During the next periodic examination, the outcomes of the three-month intervention were noted.

All interviewed hypertensive workers who were found by the physician to have abnormal BP were provided with information on the need to control their BP and adhere to medical advice. In addition, members of the group who fulfilled intervention criteria underwent a follow-up visit with the occupational physician, which was preceded by home BP measurements and a consultation with a primary care physician for further diagnosis and potential treatment or modification of HT therapy.

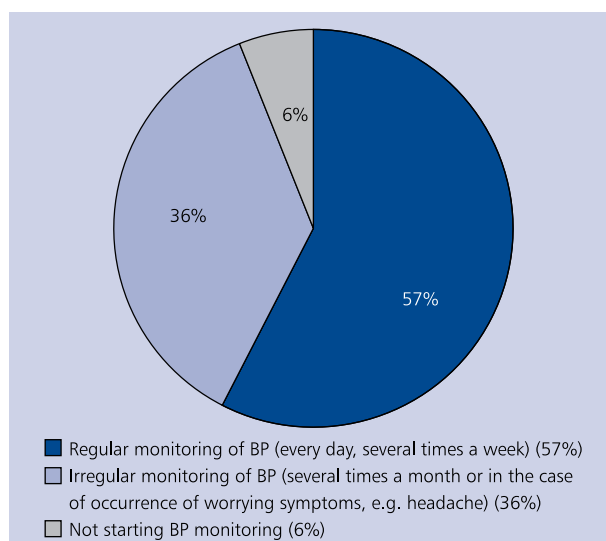
The study protocol was approved by the local Bioethical Committee at the Nofer Institute of Occupational Medicine in Lodz (decision number 04/2015, 18<sup>th</sup> Feb 2015). Participation in the study required informed, written consent.

## RESULTS

The mean age of study participants was 41.7 years (range 18–73 years) and was similar in both genders. The participants were predominantly female (55% of examined workers). A prior diagnosis of HT was declared by 203 (20.1%) subjects, 102 (22.6%) of whom were male and 101 (18.1%) were female ( $p = 0.09$ ; test of equal proportions). Classic risk factors of HT were noted more frequently in patients with history of HT than in workers without previously detected HT. In comparison with subjects without an HT diagnosis, the mean age of males with HT was approximately 10 years higher (mean age  $\pm$  standard deviation:  $39.1 \pm 11.8$  years in non-HT



**Figure 1.** Medication intake by patients with recognised hypertension



**Figure 2.** Control of blood pressure (BP) among patients with hypertension

vs.  $49.2 \pm 11.5$  years in HT male subjects,  $p < 0.001$ ; t-test). The mean age of female employees with HT was 14 years higher ( $39.3 \pm 11.0$  years in non-HT vs.  $53.3 \pm 6.3$  years in HT female subjects,  $p < 0.001$ ) compared to women without HT. The majority of workers with HT also had abdominal obesity (over 94 cm in 90% of men and  $> 80$  cm in 93% of women) in comparison with persons without detected HT (59% and 36%, respectively;  $p < 0.001$  for test of equal proportion in non-HT and HT groups of subjects, males and females together). Moreover, employees with HT were overweight (body mass index  $\geq 25$  kg/m<sup>2</sup> in 93% of men with HT and 77% in women with HT). Overweight in subjects without a history of HT was observed in approximately 51% men and 56% women. The proportion of overweight male and female subjects together satisfies  $p < 0.001$ .

The presence of occupational risk factors for CVD was rarely reported in workers with detected HT in comparison with employees without a history of HT (25% men and 15% women vs. 27% men and 17% women);  $p < 0.001$  for the proportion of overweight male and female subjects together.

Questionnaire-derived data revealed that 14 of the subjects (7% of those with history of HT) declared that they did not follow their doctor's instructions for HT treatment (Fig. 1). What is more, 36% of workers with HT admitted to intermittent monitoring of BP levels or even not measuring it at all (Fig. 2).

During mandatory prophylactic examination abnormal levels of BP in two measurements were found in 82 patients (40% of whom had already suffered from HT), with a similar prevalence among men and women (Table 1).

The criterion indicating a need for intervention was fulfilled by 27 employees (21 men and six women). Intervention was applied in:

- 13 men, due to BP  $\geq 140/90$  mmHg and co-existing occupational risk factors for HT (in eight intensified physical activity, in three intensified physical activity and noise, in two permanent stress at the workplace — decisive managerial occupation and sales representative);
- three women due to BP  $\geq 140/90$  mmHg and co-existing occupational risk factors for the development of HT (in two intensified physical activity, in one permanent stress at the workplace-decisive managerial occupation);
- eight men and three women only because of BP  $\geq 180/110$  mmHg (without confirmation of occupational risk factors for HT) (Table 1).

Among 23 from a total of 27 persons with a prior diagnosis of HT (85% of the group subjected to intervention), elevated levels of BP were reported in the doctor's office, which was also noted by patients' self-monitoring of BP at home. As a result, GPs modified the current HT therapy. Only one of these patients had normal self-measured BP values. Three men (11% of the group subjected to intervention) did not comply and refused to follow their doctor's instructions (Table 2).

## DISCUSSION

In the current study, 20% of participants declared a prior HT diagnosis, which is a lower prevalence in comparison with the data on the general Polish population (about 31%) [3]. However, it is worth emphasising that this research did not include older people, who are retired and have an increased

Table 1. Characteristics of the study group

	Male with diagnosed HT (n = 102)	Female with diagnosed HT (n = 101)	All of the workers with diagnosed HT (n = 203)	Male without HT diagnosis (n = 350)	Female without HT diagnosis (n = 457)	All of the workers without HT diagnosis (n = 807)
Age — min–max/mean [years]	23–72/49	33–65/53	23–72/51	18–68/39	19–73/39	18–73/39
Overweight or obesity (BMI ≥ 25 kg/m <sup>2</sup> )	95 (93%)	78 (77%)	173 (85%)	207 (59%)	164 (36%)	371 (46%)
Abdominal obesity (male > 94 cm, female > 80 cm)	92 (90%)	94 (93%)	186 (92%)	177 (51%)	254 (56%)	431 (53%)
Occupational risk factors for HT	26 (25%)	15 (15%)	41 (20%)	93 (27%)	78 (17%)	171 (21%)
High blood pressure (≥ 140/90 mmHg) during current periodic check-up including:	41 (40%)	41 (41%)	82 (40%)	67 (19%)	24 (5%)	91 (11%)
patients subjected to interventions due to BP ≥ 140/90 mm Hg and presence of occupational risk factors for HT	13 (13%)	3 (3%)	16 (8%)	—	—	—
patients subjected to interventions due to BP ≥ 180/110 mm Hg without presence of occupational risk factors for HT	8 (8%)	3 (3%)	11 (5%)	—	—	—
patients subjected only to health education due to BP ≥ 140/90 mmHg, without presence of occupational risk factor for HT	20 (20%)	35 (35%)	55 (27%)	—	—	—

Data are shown as mean, minimum–maximum or number (percentage). BMI — body mass index; BP — blood pressure; HT — hypertension

risk of cardiovascular diseases [14–16]. This result is also in line with expectations — health condition indicators are more benign among occupationally active persons in comparison with the general population, which can be described as a “healthy worker’s effect” [17]. Moreover, linking medical counselling with certification affecting the ability to start or continue a given occupation may be a limitation in effective prophylaxis of HT, which requires a patient’s compliance. As a result, a lower incidence of workers reporting HT will be a consequence of patients’ reluctance to disclose their health condition, fearing they may receive medical certificate confirming their potential inability to pursue a specific career [18].

The prevalence of classic risk factors for CVD reported in this study among subjects with a prior diagnosis of HT, e.g. age, overweight, and abdominal obesity, corresponds with the results of other published studies [16, 19, 20]. The similar prevalence of CVD occupational risk factors [8–11] may be explained by both workers suffering from HT knowingly avoiding such exposure and effective prevention coordinated by the occupational medicine service. During prophylactic medical check-ups, occupational health physicians assess workers’ health condition and the harmful potential of occupational exposure. As a result, they have an opportunity to find contraindications for starting or continuing an occupation, which could reduce the number of workers with HT occupationally exposed to environmental risk factors for CVD.

In the current study, the suspicion of unstable and insufficiently controlled HT was not confirmed in home BP monitoring (HBPM) in the case of only one patient. It was possible that this man suffered from “white coat syndrome”, defined as elevated BP measured in the doctor’s office, but not confirmed during 24-h ambulatory BP monitoring or HBPM [21]. However, the fact that only one case of “white coat syndrome” was reported, during a mandatory examination during which workers may be experiencing strong emotions due to the assessment of their ability to start or continue in an occupation, is very surprising.

The intervention implemented in this study resulted in the detection of uncontrolled HT among 11% of patients with a prior diagnosis of HT. Unstable BP values were confirmed by the GP and the current HT therapy was modified.

Occupational health physicians have no influence on the kind of therapy chosen for a given patient. Considering the evaluation of 26% of patients with sufficient HT treatment [3], the higher prevalence of uncontrolled HT was expected. The real prevalence could in fact be higher, as elevated abnormal BP values (≥ 140/90 mmHg) were noted among over 40% of patients who had suffered from HT (in which case the group subjected to intervention should be 82, not 27 persons). However, due to the given criteria indicating necessary intervention (a lack of occupational risk factors for CVD or BP values < 180/110 mmHg), occupational health physicians did not shorten the period until the next mandatory examination and did not refer these patients to their GP, instead educating

**Table 2.** Employees with abnormal high blood pressure level\* subjected to interventions\*\* due to suspicion of uncontrolled hypertension (HT)

	Men (n = 21)	Women (n = 6)	Both (n = 27)
Modified current HT therapy by general practitioner	17 (81%)	6 (100%)	23 (85%)
Unconfirmed insufficient HT control	1 (5%)	0 (0%)	1 (4%)
Failure to follow medical recommendations by patient: not starting blood pressure monitoring and/or not visiting general practitioner	3 (14%)	0 (0%)	3 (11%)

Data are shown as number (percentage).

\*Abnormal high blood pressure — mean of two measurements taken by occupational health physician, amounted  $\geq 180/110$  mmHg or  $\geq 140/90$  mmHg in workers occupationally exposed to risk factors for the development of cardiovascular diseases.

\*\*Intervention — health education, blood pressure monitoring (three times a day: in the morning, in the middle of the day, and in the evening—through the following seven days, record of the results and evaluation by general practitioners with verification of hypertension suspicion or uncontrolled hypertension, possible implementation of treatment or modifying non effective therapy, re-visit in occupational health physician's office due to shortened period until the next mandatory prophylactic examination of worker.

patients on the subject of starting HT treatment in the case of recurrent high BP measurements. This is a serious limitation of the study. On the other hand, this approach consciously resulted from the fact that mandatory medical periodical examinations are financed by employers. According to the current law, an occupational health physician may designate a faster check-up than specified in the methodological guidelines of the Minister of Health if he/she considers it necessary for a proper health assessment of a worker [18]. Earlier data indicate that the workers' following of obligatory medical check-ups is an additional financial burden for the employer and requires occupational health physicians to justify this decision in the context of the workplace environment besides prophylaxis of civilization diseases. However, considering the possibilities of additional prophylactic activities being implemented during periodic mandatory employee examinations (focused on factors directly associated with work or non-occupational), it is worth reporting an increasing interest and involvement of employers in financing a wide range of workers' health prophylaxis, not only indirectly related to the labour code rules [22].

The major problem in uncontrolled HT seems to be lack of compliance in regular therapy. In this study only three (11%) subjects did not comply with medical indications, while other studies show a higher percentage of patients' non-compliance (in comparison with the study carried out by Dziwura-Ogonowska et al. [23] — among 4635 patients with HT treated by a GP, only 45% regularly took HBPM, and 57.8% regularly visited their doctors).

In the opinion of the authors, the higher prevalence of actions that are meant to improve the HT diagnosis revealed in the current study may be explained by the pressure exerted on both workers and their doctors. The employees were forced to visit their occupational health physician again to obtain certification that they were able to continue their job.

On the other hand, some form of pressure on the GPs to whom the patient was referred for further diagnosis, the decision to maintain or modify the therapy, and feedback on the steps taken, should be considered. The fact that the choice of therapy might be verified by another doctor might

provide motivation to implement more effective diagnosis, treatment, and its evaluation.

Due to this fact, mandatory examinations of workers can be very useful in reducing therapeutic inertia, defined as a lack of modification of treatment despite an uncontrolled clinical course of the disease [19, 20]. Among the 85% of workers subjected to intervention in our study, insufficient HT therapy was modified by doctors in charge of treatment, which is confirmation of the previously described hypothesis. It seems important to compare this result to the POSTER study, in which only 37% of patients with uncontrolled HT had seen their current therapy modified in the six-month period before the planned check-up [20].

Emphasised by other researchers, insufficient health consciousness in society [24] was confirmed in this study by questionnaire-derived data from the patients with HT because, in spite of medical advice, only 13% declared taking their medication irregularly, or failing to do so at all. While it is true that 94% of subjects with HT declared that they knew their BP values, only 57% regularly took measurements. The real occurrence of irregular treatment was probably higher, but intentionally not reported by workers in fear of being declared unfit for work. In spite of this, employers' obligatory periodic medical check-ups have a positive impact on therapy compliance through education, regular doctors' visits, and regular monitoring of treatment outcomes [5].

## CONCLUSIONS

1. Mandatory prophylactic medical examinations of employees allow improved surveillance of HT in patients with an uncontrolled clinical course of this disease.
2. The obligatory and cyclical nature of the examinations puts pressure on both the patient and the physician treating him/her. This increases the chance of patient compliance, and may positively influence the physician's therapeutic inertia, allowing the disease to be treated effectively.

**Conflict of interest:** none declared

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