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Occupational Health Services Improve Effective Coverage for Hypertension and Diabetes Mellitus at Japanese Companies

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Abstract : The World Health Organization (WHO) aims to enable all people to receive health services, and has proposed effective coverage (EC) as an index for this aim. EC refers to “the fraction of potential health gain that is actually delivered to the population through the health system, given its capacity,” and is used to indicate the percentage of the population whose diseases are well controlled among those who require treatment or are receiving treatment. This study aimed to evaluate the effects of occupational health services on EC. We hypothesized that occupational health services provided to employees by full-time occupational health practitioners, such as occupational physicians and occupational health nurses, improve EC for hypertension, diabetes mellitus and hyperlipidemia compared to those services provided by part-time occupational health practitioners. We conducted a cross-sectional study to analyze the results of general medical examinations, personnel information, and medical expense claims in fiscal year 2011. A total of 91,351 male employees at a company group participated in the study. The EC for hypertension, diabetes mellitus and hyperlipidemia was measured and compared between the employees in workplaces with occupational health practitioners (OH group) and the employees in workplaces without occupational health practitioners (non-OH group). The EC for hypertension and diabetes mellitus was significantly greater in the OH group than in the non-OH group (aOR: 1.41, 95% CI: 1.20–1.66 for hypertension; aOR: 1.53, 95% CI: 1.17–2.00 for diabetes mellitus), while the EC for hyperlipidemia was comparable (aOR: 1.11, 95% CI: 0.92–1.34). Occupational health services provided by full-time occupational health practitioners greatly improve health management after a medical examination.

Keywords : UHC, EC, cross-sectional study, medical claim, occupational health practitioner.

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Introduction

The Industrial Safety and Health Act of Japan requires employers to provide their employees with annual general medical examinations and requires employees to undergo them. The objectives of the general medical examination are to assess fitness to work and the risk of cerebrocardiovascular disease. To attain these objectives, the Ministry of Health, Labour and Welfare (MHLW) established ordinances regarding mandatory tests required in medical examinations, including blood pressure, blood glucose, and lipid testing, which is a risk factor of cerebrocardiovascular disease [1]. These objectives can be attained if employees take appropriate action to prevent diseases based on the results of their general medical examination. To enable a high-risk approach for the prevention of cerebrocardiovascular disease based on the results of general medical examinations, employees who are found to require treatment must visit medical institutions and undergo diet therapy, exercise therapy and other appropriate treatment to maintain their condition at target levels.

Many employers commission third parties to conduct medical examinations due to a lack of facilities or personnel [2]. The third parties notify the employees of the results of the medical examination using their own formats, and advise them to visit medical institutions, improve their lifestyle, or take appropriate action, but many employees who are told they require treatment do not visit medical institutions [3]. To resolve this issue, the Industrial Safety and Health Act was established to urge employers to have physicians and nurses provide advice about health management to their employees [1]. The MHLW has issued "Guidelines on measures to be taken by employers based on results of health examination", which recommends employers to encourage their employees to undergo re-examinations or more detailed examinations or to visit medical institutions based on the results of their medical examination [4].

Aono *et al* reported that in small-to-medium-sized workplaces with more than 50 employees, the number of employees who underwent detailed examinations was significantly higher when nurses provided advice regarding health management [5]. Advice regarding health management is therefore expected to

increase the number of employees who visit medical institutions. Such advice and increased numbers of visits would be useless, however, if continuous treatment and proper health management did not reduce the risk of cerebrocardiovascular disorders. The quality of medical services by physicians is thought to have a marked effect on whether or not high-risk employees continue treatment and make the required lifestyle changes. Additionally, various factors related to occupational health services, including improvement in health literacy through health education and work environments that encourage employees to visit medical institutions, may also be important factors [6, 7].

The World Health Organization (WHO) recommends that effective coverage (EC) be used over crude coverage (CC) as an index for the universal health coverage (UHC) of national/regional medical systems [8]. In health terms, those who require specific medical services are defined by the term "need", users of medical services by "use", and the percentage of those who show therapeutic effects by "quality". CC is defined as "use/need". This suggests that CC improves as health services improve. While a high CC is great, medical services do not always lead to preferable therapeutic outcomes due to a number of factors, including problems with the quality of medical services and user awareness. The WHO defines EC as $CC \times \text{quality}$, which refers to "the fraction of potential health gain that is actually delivered to the population through the health system, given its capacity" [9]. EC was first used in Mexico to assess the medical services in each state [10], and it has been used mainly in developing countries since then [11, 12]. EC can also be used as an index for other contexts and subjects; it has been used to improve treatment for and prevention of non-infectious diseases in developed countries [13].

Few studies have assessed the usefulness of occupational health services. Large-scale research that compared the incidence of myocardial infarction between employees at large workplaces employing full-time occupational physicians and local residents showed that the incidence of myocardial infarction was lower among the male employees at large workplaces than among the local residents [14]. Similar results were also obtained in large-scale research comparing the mortality from myocardial infarction between em-

employees at large workplaces employing full-time occupational physicians and local residents [15], although the results of these studies may have been affected by socioeconomic differences and job type, including differences in income and educational standards.

The present study was conducted to evaluate the effects of occupational health services based on objective information, including data from medical claims of the employees of a large company group. The Industrial Safety and Health Act of Japan requires the employment of full-time occupational physicians at workplaces with more than 1,000 employees and those with more than 500 employees engaged in special operations [1]. Many workplaces with fewer employees also employ full-time occupational health nurses. We hypothesized that occupational health services provided at workplaces employing full-time compared to part-time (one day a week or one day a month) occupational health practitioners (occupational physicians and occupational health nurses) would improve the EC for hypertension, diabetes mellitus and hyperlipidemia.

Methods

Study design and participants

We conducted a cross-sectional analysis of general medical exam data, human resources information, and medical claims data (inpatient and outpatient) from April 2011 to March 2012 of 90,658 male employees at a general electrical manufacturer in Japan. We excluded male employees over 60 years old ($n=429$) because they are beyond the basic retirement age in Japan and only continue to work if they desire and if they do not have significant health problems. We also excluded male employees under 39 years old ($n=33,646$) because their lifestyle-disease prevalence is relatively low. We also excluded 579 employees who had a lack of medical examination data and personal data. Additionally, because occupational health practitioners advised employees to visit medical institutions and continue to receive treatment for the prevention of stroke and myocardial infarction, those who were found to have any of the following diseases at the time of medical examination were also excluded from the analyses: myocardial infarction ($n=557$); stroke ($n=357$);

malignant tumors ($n=558$); and kidney failure/dialysis ($n=843$). The remaining 53,720 employees were analyzed in the present study. A flow diagram of the participants in this study is shown in Fig. 1.

Our research protocol was approved by the Ethics Committee of Medical Research, University of Occupational and Environmental Health, Japan (H29-023).

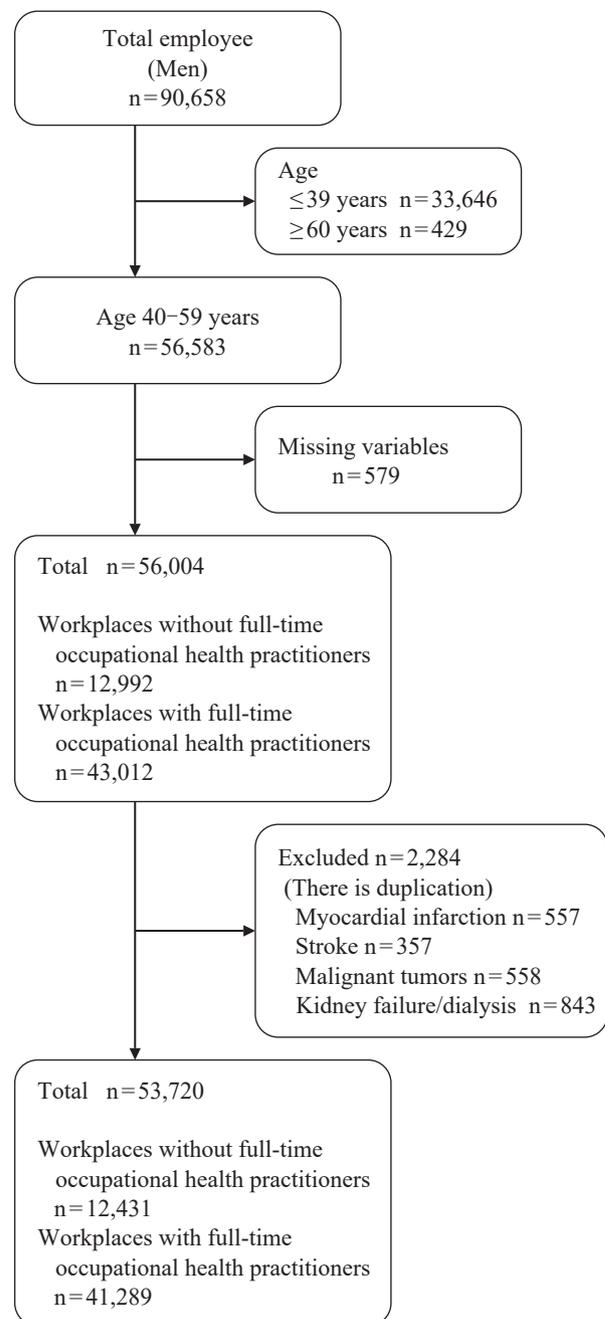


Fig. 1. Schematic diagram depicting study population.

Presence or absence of occupational health practitioners

The company had 1,359 business sites in fiscal year (FY) 2011. Workplaces in Japan with 50 or more employees are legally required to employ occupational physicians, and, as mentioned above, workplaces with more than 1,000 employees and those with more than 500 employees engaged in special hazardous operations are legally required to employ full-time occupational physicians [1]. Of the company's 1,359 sites, 265 sites employed neither occupational physicians nor nurses (8,559 employees), 146 sites employed part-time occupational physicians or nurses (3,872 employees), 393 sites employed part-time occupational physicians and full-time occupational health nurses (14,690 employees), and 555 sites employed both full-time occupational physicians and occupational health nurses (26,599 employees).

The company notifies each employee of the results of their medical examination, and the employees are classified under "hospital visit needed (treatment is needed at a medical institution)", "health management needed (although no treatment is needed, lifestyle must be improved)", or "no abnormalities". At workplaces with full-time occupational health practitioners, the occupational health practitioners ensure that those classified under "hospital visit needed" have visited medical institutions, and they provide advice regarding health management to those classified under "health management needed". In contrast, close follow up of employees at workplaces without full-time occupational health practitioners is difficult. In this study, workplaces with full-time occupational health practitioners (occupational physicians or occupational health nurses) were classified into the OH group (948 workplaces, 41,289 employees), and workplaces without full-time occupational health practitioners into the non-OH group (411 workplaces, 12,431 employees).

Health information

The following information was obtained from routine medical examinations conducted in FY 2011 and used for analyses: attributes (sex, age, and occupation categories); a self-administered questionnaire that included smoking status, current oral medications (blood pressure-lowering drugs, blood glucose-lowering drugs or insulin injections, and cholesterol- or neutral fat-

lowering drugs) and disease history (myocardial infarction, stroke, malignant tumors, and kidney failure/dialysis); and objective test results (body mass index (BMI), smoking habits, occupation type, fasting blood glucose (FBG), lipids (low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and triglycerides), systolic blood pressure, and diastolic blood pressure).

Workers were grouped by age according to five-year categories. Occupation was grouped as sales, research and development, and product, or office work and others. Smoking status was categorized as smoker, ex-smoker, or non-smoker. BMI was categorized as <18.4, 18.5–24.9, 25.0–29.9, 30.0–34.9, or ≥ 35.0 kg/m².

Socio-economic information

We extracted data on employees' standard monthly remuneration for FY2011, which is determined by health insurance unions as the total monthly income binned according to 50 appropriate categories for calculation of insurance premiums and benefits. The average standard monthly remuneration among employees of the participating company were divided into low ($\leq 410,000$ yen), middle (410,000–560,000 yen), and high ($> 560,000$ yen).

Records of visits to medical institutions

To determine whether employees visited the required medical institutions, we referred to medical expense claims for the date of hospital visit, the name of the disease, medical fees, and other information. Medical expense claims of inpatients and outpatients between April 1, 2011 and March 31, 2012 were used to confirm that employees had visited a medical institution and had received the explanation that hypertension, diabetes mellitus or hyperlipidemia was suspected. We did not check whether or not employees had properly taken the oral drugs prescribed. Those who were treated for these diseases were referred to as "use (hypertension)", "use (diabetes mellitus)", and "use (hyperlipidemia)".

Crude coverage (CC) and effective coverage (EC)

Effective coverage is defined as the fraction of potential health gain that is actually delivered to the population through the health system, given its capacity [9]. It

is comprised of three factors: “Need”, “Use”, and “Quality”. In this study “Need” refers to employees who need medical services; “Use” refers to received medical services among those who need them; and “Quality” refers to the rate at which level of health improves with medical service. Those who required medical services for hypertension, diabetes mellitus or hyperlipidemia were determined by the following criteria:

“Need (hypertension)”: systolic blood pressure ≥ 160 mmHg, diastolic blood pressure ≥ 100 mmHg, or treatment with oral antihypertensive drugs.

“Need (diabetes mellitus)”: FBG ≥ 160 mg/dl or a history of treatment with hypoglycemic drugs or insulin.

“Need (hyperlipidemia)”: LDL-cholesterol ≥ 160 mg/dl, HDL-cholesterol < 35 mg/dl, triglyceride ≥ 300 mg/dl, or treatment with oral cholesterol-regulating drugs.

Those who met any of these criteria were classified under “hospital visit needed” on the basis of the results of their medical examination and were noted as requiring consultations with full-time occupational health practitioners at the participating company.

Those who were well controlled for hypertension, diabetes mellitus or hyperlipidemia were determined by the following criteria:

“Effectiveness (hypertension)”: systolic blood pressure < 140 mmHg and diastolic blood pressure < 90 mmHg.

“Effectiveness (diabetes mellitus)”: FBG < 126 mg/dl.

“Effectiveness (hyperlipidemia)”: LDL-cholesterol < 140 mg/dl, HDL-cholesterol ≥ 40 mg/dl, and triglycerides < 150 mg/dl.

CC refers to the percentage receiving medical services among those who require specific medical services, and was calculated by the following formula:

Crude coverage (CC) = Use/Need.

The quality refers to the percentage showing therapeutic effects among those who use medical services, and was calculated by the following formula:

Quality = Effectiveness/Use.

EC refers to the quality and was calculated by the following formula:

Effectiveness (EC) = CC * Quality = Effectiveness/Need.

Statistical analyses

The percentage of employees in the OH group and non-OH group was determined according to age, BMI, smoking status, job classification and average standard

monthly remuneration. CC and EC were calculated for the OH group and non-OH group. The odds ratio (OR) and its 95% confidence interval (CI) were determined by whether or not employees who were found to require medical services (need) actually did visit medical institutions, and were compared between the OH group and non-OH group using logistic regression for hypertension, diabetes mellitus and hyperlipidemia. Age, average standard monthly remuneration and job classification were adjusted, and multilevel analyses were performed using each employee as the primary level and each workplace as the secondary level of analysis. The OR and its 95% CI were also determined in regard to whether or not diseases were well controlled in employees who were found to require medical services (need), and were compared between the OH group and non-OH group using logistic regression for hypertension, diabetes mellitus and hyperlipidemia. Age, standard monthly remuneration and job classification were adjusted, and multilevel analyses were performed as described above.

Results

The employees' characteristics are shown in Table 1. Of the 53,720 employees, 12,431 comprised the non-OH group and 41,289 comprised the OH group. The proportion of obese individuals (BMI ≥ 25.0) in the non-OH group was slightly higher than in the OH group. The proportion of smokers was also higher in the non-OH group than in the OH group. The majority of employees in the non-OH group were engaged in sales, as opposed to research and product development and office/other work. The lowest standard monthly remuneration was higher in the non-OH group, while the highest standard monthly remuneration was lower in the non-OH group than in the OH group.

Both CC and EC in hypertension, diabetes mellitus and hyperlipidemia were higher in the OH group. The ORs for whether or not employees who were in need of medical treatment visited medical institutions for hypertension, diabetes mellitus and hyperlipidemia are shown in Table 2. The number of employees who visited medical institutions for treatment of hypertension was significantly higher in the OH group than in the non-OH group (aOR = 1.28, 95% CI = 1.07 – 1.54).

There were no significant intergroup differences in the number of employees who visited medical institutions for treatment of diabetes mellitus or hyperlipidemia (diabetes mellitus: aOR = 1.17, 95% CI = 0.85 – 1.62; hyperlipidemia: aOR = 1.00, 95% CI = 0.89 – 1.13).

The odds ratio for whether or not diseases were well controlled among employees who were found to require medical treatment for hypertension, diabetes mellitus and hyperlipidemia is shown in Table 3. Hypertension and diabetes mellitus were more effectively controlled in the OH group than the non-OH group (hypertension: aOR = 1.41, 95% CI = 1.20 – 1.66; diabetes mellitus: aOR = 1.53, 95% CI = 1.17 – 2.00). In contrast, there were no significant intergroup differences for the control of hyperlipidemia (aOR = 1.11, 95% CI = 0.92 – 1.34).

Discussion

This study found that daily occupational health services provided at workplaces by full-time occupational health practitioners such as occupational physicians and occupational health nurses improved the CC and EC for hypertension and the EC for diabetes mellitus, but did not significantly affect the CC for diabetes mellitus. There were no significant inter-group differences in the CC or EC for hyperlipidemia.

Objective data on the difference in the occupational health service between the OH group and the non-OH group were available, but the company had a headquarters function that directed full-time occupational health practitioners and instructed them in the implementation of certain occupational health services, whereas part-time practitioners worked at their own discretion without any instructions from the headquarters, or many of them did not have sufficient time for such services that were available at the sites with full-time practitioners. It is possible that the CC and EC were affected more by the difference in the activities between the two groups rather than by the existence of full-time versus part-time practitioners.

The CC for hypertension, diabetes mellitus and hyperlipidemia in the non-OH group were 79%, 87% and 33%, respectively. These values were higher than those reported by Yamaguchi *et al* [16] and Fukuda [3], which may have been due to differences in criteria for hospital visit recommendations. The former

Table 1. Baseline characteristics of employees

	Workplace without full-time occupational health practitioners	Workplace with full-time occupational health practitioners
Number of subjects	12,431	41,289
Age categories (%)		
40–44	16.4	9.8
45–49	33.6	34.0
50–54	27.2	34.1
55–59	22.8	22.2
BMI (%)		
≤18.4	2.6	2.8
18.5–24.9	64.0	67.8
25.0–29.9	28.2	25.5
30.0–34.9	4.5	3.4
≥35.0	0.7	0.6
missing	0.1	0.0
Smoking status (%)		
Non-smoker	47.1	44.3
Ex-smoker	10.6	18.9
Smoker	42.1	36.6
Missing	0.2	0.1
Job classification (%)		
Sales	37.3	10.5
Research and development, and product	29.0	64.0
Office work and others	33.7	25.5
Standard remuneration monthly fee (JPY) (%)		
Low ≤410,000	35.4	23.2
Middle 410,000 – 560,000	41.6	34.8
High >560,000	23.0	42.0

study reported that less than 50% of employees visited medical institutions among those who were suspected of having diabetes mellitus based the results of occupational medical examinations, while the latter reported that 50%, 30% and 3% of employees visited medical institutions among those who were suspected of having diabetes mellitus, hypertension and hyperlipidemia, respectively, based the results of medical examinations conducted by health insurance unions

Table 2. Odds ratios for whether or not employees found to require medical treatment visited medical institutions for hypertension, diabetes mellitus, and hyperlipidemia

	Number needing treatment	Number visiting medical institutions for treatment	Crude coverage* (%)	Odds ratio for visiting medical institutions for treatment			
				adjusted OR**	95%CI	<i>p</i>	
Hypertension							
Workplaces without full-time occupational health practitioners	1461	1148	78.6	reference			
Workplaces with full-time occupational health practitioners	4661	3901	83.7	1.28	1.07	1.54	0.008
Diabetes mellitus							
Workplaces without full-time occupational health practitioners	474	411	86.7	reference			
Workplaces with full-time occupational health practitioners	1300	1149	88.4	1.17	0.85	1.62	0.331
Hyperlipidemia							
Workplaces without full-time occupational health practitioners	2905	959	33.0	reference			
Workplaces with full-time occupational health practitioners	9363	3267	34.9	1.00	0.89	1.13	0.977

*: Crude coverage: Number visiting medical institutions for treatment / Number needing treatment \times 100, **: Univariate logistic regression analysis adjusted for age, job type and standard remuneration monthly fee, OR: Odds ratio, CI: Confidence interval

Table 3. Odds ratios for whether or not diseases were well controlled among employees found to require medical treatment for hypertension, diabetes mellitus, and hyperlipidemia

	Number needing treatment	Number with effective control	Effective coverage* (%)	Odds ratio for effective control			
				adjusted OR**	95%CI	<i>p</i>	
Hypertension							
Workplaces without full-time occupational health practitioners	1461	682	45.7	reference			
Workplaces with full-time occupational health practitioners	4661	2611	56.6	1.41	1.20	1.66	<0.001
Diabetes mellitus							
Workplaces without full-time occupational health practitioners	474	89	18.8	reference			
Workplaces with full-time occupational health practitioners	1300	345	26.5	1.53	1.17	2.00	<0.001
Hyperlipidemia							
Workplaces without full-time occupational health practitioners	2905	203	7.0	reference			
Workplaces with full-time occupational health practitioners	9363	817	8.7	1.11	0.92	1.34	0.283

*: Effective coverage: Number with effective control / Number needing treatment \times 100, **: Univariate logistic regression analysis adjusted for age, job type and standard remuneration monthly fee, OR: Odds ratio, CI: Confidence interval

on employees over the age of 40 years at small-to-medium-sized workplaces. This suggests that medical interventions and advice regarding health management by part-time occupational physicians were effective even in the non-OH group.

We found that the CC for hypertension was greater in the OH group. This is likely attributable to thorough instructions provided by full-time occupational health practitioners after medical examinations. Studies have reported that a significantly greater number of employees at small-to-medium-sized workplaces visit medical institutions for detailed examinations after receiving such instructions from public health nurses [5], and that a higher number of employees visit medical institutions when the public health center issues a letter of introduction after an adult medical examination [17]. The present study found no differences in the CC for diabetes mellitus between the OH group and non-OH group, with the CC for diabetes mellitus being 87% in the non-OH group. This suggests that the majority of employees visit medical institutions based only on instructions written in medical examination reports.

In contrast, the CC for hyperlipidemia was 33% in the non-OH group and 35% in the OH group, indicating that occupational health services had no effect on subsequent health-promoting actions. Tateishi *et al* reported that while experienced occupational physicians advised employees to reduce their workload when either their blood pressure or blood glucose level was abnormally high, few occupational physicians advised employees to do so when their blood lipid levels were abnormally high. This suggests that some occupational health practitioners may not be keen to provide advice or instructions regarding blood lipid levels [18]. Furthermore, even when occupational health practitioners do provide advice to employees with hyperlipidemia, those employees are not inclined to receive such treatment. Tatemichi *et al* reported that when health experts advised employees at large workplaces who were found to require treatment for hypercholesterolemia to start drug therapy following a lack of response to three-month dietary therapy, approximately 50% agreed to receive drug therapy, while one-third of those who did not agree to receive drug therapy also rejected dietary therapy [19]. This was

likely because employees with hypercholesterolemia have fewer subjective symptoms than those with other diseases and are unlikely to exhibit presenteeism despite poorly controlled cholesterol levels [20].

“Quality”, a feature of EC that is affected by the quality of medical services, refers to the percentage who show therapeutic effects among those who use medical services, with those showing therapeutic effects defined by those whose medical condition is well controlled by treatment. The role of occupational health practitioners is to advise those who are found to require treatment based on the results of a medical examination to visit medical institutions and undergo appropriate treatment, rather than to provide treatment. The EC for hypertension and diabetes mellitus improved in the OH group, and the OR was greater for EC than for CC, which suggests that occupational health services contribute to the management of diseases even after medical treatment has started. The Industrial Safety and Health Act requires employees to take appropriate action regarding their work based on physicians’ advice if the results of their medical examination suggest that their disease is poorly controlled. Therefore, employees must consider their health and reduce their workload even if they are receiving medical treatment [1, 4]. Occupational physicians and other occupational health practitioners often examine the progress of treatment and provide advice to employees in cooperation with physicians. Thorough health management is thought to contribute to the improvement of EC, especially in workplaces employing full-time occupational health practitioners. Tateishi *et al* reported that in cases of either abnormal blood pressure or blood glucose levels, occupational physicians should advise employers to reduce the affected employees’ workload [18]. Employers are responsible for reducing employees’ workload, and may be blamed for the occurrence of overwork-related hypertension, diabetes mellitus, other cerebrocardiovascular diseases or death if work conditions are poor.

At workplaces with well-established occupational health service systems, the human resources department and executive officers are likely to take appropriate action for health management based on advice from occupational physicians, while this is unlikely to occur at workplaces without occupational physicians,

leading to insufficient advice regarding health management and instructions for hospital visits. Occupational health services are provided by a team comprised of occupational physicians, occupational health nurses, and other staff members. In particular, occupational physicians have been required to perform a wide range of tasks in recent years [21]. Occupational health services include medical examinations, follow-ups based on the results of medical examinations, establishment of a health committee, health education, industrial hygiene education, and mental health services. The level of health literacy of employees is related to healthy lifestyle habits, including regular eating habits, regular exercise, and a smoke-free lifestyle [6]. Various occupational health services have improved the health literacy of employees in the OH group, enabling them to check the results of their medical examination, to voluntarily visit medical institutions, and to receive appropriate management of treatment, regardless of whether or not they were directly given such instructions from occupational health practitioners. There were no significant differences in the EC for hyperlipidemia between the OH group and non-OH group. The “quality” was 21% for the non-OH group and 25% for the OH group. Tatemichi *et al* reported that approximately 50% of patients with hypercholesterolemia who had started drug treatment after a medical examination discontinued hypercholesterolemia treatment within three years [22]. This suggests that those who are found to require treatment for hyperlipidemia based on the results of a medical examination are unlikely to visit medical institutions or to continue treatment.

Whether or not employees visit medical institutions after a medical examination is affected by various work and personal factors. Tsuda *et al* reported that when employees who were suspected of having diabetes mellitus were advised to visit medical institutions, those who could easily take a day off and those with well-managed jobs were more likely to do so. Those who worked 61 hours or more a week were less likely to visit medical institutions than those who worked less than 61 hours a week [23]. Goto *et al* reported that the factors for employees visiting medical institutions as advised after a medical examination despite not having visited a medical institution in the past three years

included living alone, having a personal physician, low job demand, and lower-rated health [7]. It is important to continue treatment after the initial visit to a medical institution, even among those with low incidence of complications and low mortality rates. Goto *et al* also reported that there was no relationship between shift-work, overtime work, stress, or other work factors, and whether or not employees continued treatment [7]. Sato *et al* reported that full-time employees who had some symptoms were more likely to visit medical institutions if they did less overtime work, and that they were more likely to take supplements if they did more overtime work [24]. Azami *et al* reported that among employees with diabetes mellitus, those who did not visit medical institutions had higher HbA1c than those who did visit medical institutions, and that working long hours and having holidays other than Sunday increased the risk of not visiting medical institutions [25]. This suggests that better occupational health services and work environments that enable employees to engage in both treatment and work are essential for improving EC.

The present study has several limitations. The purpose of this study is to clarify the impact of differences in comprehensive occupational health services due to the presence or absence of full-time occupational health practitioners, but some objective data on the services, such as minutes spent with each employee, were not available. We adjusted for job type and standard monthly remuneration in our analyses as these may affect CC and EC and because they differed between the OH group and non-OH group, but because there was no information on other work or personal conditions, there is a possibility that other work and personal conditions may have affected the results of the study as confounding factors. We identified items for “need” by referring to the results of medical examinations and medical interview sheets from 2011, and identified items for “use” through medical expense claims from 2011. Therefore, depending on when the medical examination was performed, information on treatment in employees who were found to require treatment may not have been taken into consideration. Furthermore, because we examined employees from only one company group, our results may not be generalizable. However, an advantage of this study was that we identified treatment and outcomes by referring

to objective data such as medical expense claims and the results of medical examinations.

The Industrial Safety and Health Act requires that all employees undergo medical examinations, regardless of the size of their workplace. However, only a limited number of workplaces employ full-time occupational physicians, occupational health nurses and other occupational health practitioners. Workplaces with more than 50 employees are required to employ part-time occupational physicians, while those with fewer than 50 are unlikely to have occupational health practitioners to check the results of employees' medical examinations. The results of this study suggest that occupational health service systems greatly affect employees' health-related actions, such as visiting a medical institution and receiving appropriate health management after a medical examination. Appropriate action is therefore required to improve health management among employees of small-to-medium-sized workplaces.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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産業保健サービスの存在は企業における高血圧および糖尿病のEffective Coverageを向上させる

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要 旨：WHOは「各国・地域において、人々が経済的困難を伴わず保健医療サービスを享受すること」を目標としており、その指標としてEffective Coverage(EC)という概念を提唱している。ECとは“その国または地域における健康システムを通して、実際に人々に健康増進をもたらすことができる割合”と定義されており、産業保健の場面では治療が必要、もしくは治療を受けているうち、適切に疾病管理されている率に該当すると考えられる。本研究では産業保健サービスの効果を評価することを目的とし、「常勤の産業保健スタッフ(産業医または産業看護職)による労働者への産業保健サービスの提供は、高血圧、糖尿病、脂質異常症の各項目について、ECを向上させる」という仮説をたてて検証した。2011年度の一般健康診断、人事情報、及びレセプトからの個々のデータを分析した横断的研究である。特定の大規模企業グループの91,351人の男性労働者を対象とした。常勤の産業保健スタッフがいる事業場に所属する労働者(OH群)とそれ以外の事業場に所属する労働者(non-OH群)において高血圧、糖尿病、脂質異常症の各項目別にECを算出し、比較した。OH群はnon-OH群に比べて、高血圧・糖尿病において有意にECが高率であったが、脂質異常症については有意な差を認めなかった(高血圧aOR 1.41: 95%CI 1.20-1.66, 糖尿病aOR 1.53: 95%CI 1.17-2.00, 脂質異常症aOR 1.11: 95%CI 0.92-1.34)。常勤の産業保健スタッフによる産業保健サービスの提供は、健康診断後の適切な管理に大きく影響する。

キーワード：UHC, EC, 横断的研究, 診療報酬明細書, 産業保健スタッフ。