The opinions of occupational physicians about maintaining healthy workers by means of medical examinations in Japan using the Delphi method

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Abstract: The opinions of occupational physicians about maintaining healthy workers by means of medical examinations in Japan using the Delphi method: Seiichiro Tateishi, et al. Occupational Health Training Center, University of Occupational and Environmental Health, Japan—Objectives: In Japan, employee fitness for work is determined by annual medical examinations. It may be possible to reduce the variability in the results of work fitness determination, particularly for situation, if there is consensus among experts regarding consideration of limitation of work by means of a single parameter. Methods: Consensus building was attempted among 104 occupational physicians by employing a 3-round Delphi method. Among the medical examination parameters for which at least 50% of participants agreed in the 3rd round of the survey that the parameter would independently merit consideration for limitation of work, the values of the parameters proposed as criterion values that trigger consideration of limitation of work were sought. Parameters, along with their most frequently proposed criterion values, were defined in the study group meeting as parameters for which consensus was reached. Results: Consensus was obtained for 8 parameters: systolic blood pressure 180 mmHg (86.6%), diastolic blood pressure 110 mmHg (85.9%), postprandial plasma glucose 300 mg/dl (76.9%), fasting plasma glucose 200 mg/dl (69.1%), Cre 2.0mg/dl (67.2%), HbA1c (JDS) 10% (62.3%), ALT 200 U/l (61.6%), and Hb 8 g/l (58.5%). Conclusions: To support physicians who give advice to employers about work-related measures based on the results of general medical examinations of employees, expert consensus information was obtained that can serve as background material for making judgments. It is expected that the use of this information will facilitate the ability to take appropriate measures after medical examination of employees. (J Occup Health 2016; 58: 72–80)

Key words: Delphi method, Fit for work, Japan, Medical examination, Occupational physicians

In Japan, employee fitness for work is determined by annual medical examinations. Accidents derived from occupational pursuits occur in workers and involve both the environment and the contents of work. Therefore, to ensure the safety and health of workers, it is important to reduce safety and health risks that are inherent in the work environment and the work itself⁰, and it is necessary to implement appropriate allocation policies and other considerations for work after assessing the fitness for work of individual workers based on an adequate understanding of their health status.

For assessment of fitness for work, the following two methods are available: implementation of basic medical examinations for a wide range of workers and assessment of specific parameters for workers who are engaged in jobs requiring higher fitness. In countries where a general medical examination system is not available, the latter method is commonly used⁰. In contrast, in Japan, the former method is fundamentally applied because employers are under legal obligation to implement general medical examinations for all workers and provide measures regarding their health based on the results of such examinations⁰.

Implementation of post-examination measures following general medical examinations of workers consists of confirmation by a physician of the exami-
nation results for each worker with assignment to one of three classes, i.e., usual work applicable, limitation of work required, and prohibition of work required, and implementation of necessary measures for work based on the opinions of the physician. In such cases, it is desirable that the physician understand the work environment, the contents of work, and intra-company procedures and systems. In Japan, any business place employing 50 or more workers is obliged to appoint an occupational physician. Therefore, in principle, occupational physicians commonly play this role in workplaces that exceed a certain scale.

Analysis of the purposes and bases of the advice given by occupational physicians regarding limitation of work provided to employers revealed that the grounds for occupational physicians advising limitation of work were divided into several major categories. These categories were as follows: continuation of the current work may aggravate the employee’s health impairment (type 1); emergence of the individual’s symptoms may complicate the person’s surrounding circumstances under the conditions of the current work contents and environment (type 2); the current illness is poorly controlled and difficult to manage for work-related reasons (type 3); communication to the head of the department/supervisor (type 4); and fit for work with appropriate adjustment of work environment and/or conditions (type 5). The safety and health measures implemented in workplaces, including limitation of work based on the results of medical examinations, should be evaluated through consideration of both the health status of the worker in question and work related factors (work environment, work contents, etc.). Therefore, numerous and complex combinations of the relationships between the worker’s health status and work-related factors must be considered. Because of this, it is not possible to set up definite and uniform criteria for assessment. However, it is possible to define information sets available as the basis for judgment, in light of the respective purposes. For instance, in the case of type 1 as defined above, the basis is information on changes in health status of the worker provided by the physician in charge, whereas for type 2, the basis is information on the probability of the occurrence of epileptic seizures, arrhythmias, and cerebro- and cardiovascular diseases and, if they were to happen, the severity of related problems. The basis for judgements for type 4 is related to paying attention to the health of workers and properly setting limits uniformly such as limits concerning working for long period of time. For type 5, the basis for judgement is related to the employment of persons with disabilities. On the other hand, for type 3 as defined above, the major aim is genuine facilitation of health maintenance for the individual worker, and the results of tests conducted as part of the medical examination thus provide an important information set. Accordingly, it is useful to obtain information on the values of laboratory parameters that the current work contents exert negative influences on and require improvement, even by means of limitation of work. Availability of expert consensus information regarding these laboratory parameters may facilitate the ability of occupational physicians to make judgments and may minimize variation in the results of decision-making among different occupational physicians.

Subjects and Methods

Consensus methods have been developed for the purpose of building consensus based on experts’ opinions when sufficient evidence is lacking or when there are controversial viewpoints. To obtain the consensus of experts on laboratory values that merit consideration in regards to improvement by limitation of work, the Delphi method, a representative consensus method, was used. The Delphi method is a consensus-forming technique in which questionnaires are sent to experts and feedback is obtained in the form of the collected responses repeatedly to obtain consensus. Specifically, we attempted to develop consensus information regarding reference values as the basis for making judgments after consensus was obtained concerning individual general medical examination parameters based on the Industrial Health and Safety Act that independently merit consideration of limitation of work. Three rounds of the questionnaire survey, with feedback on the results of the preceding survey being obtained for each, were conducted. Reaching a consensus among experts was attempted using this approach.

Participants in this survey, which applied the Delphi method, were required to be exclusively full-time occupational physicians engaged in the field of occupational health, industrial hygiene organization physicians, independent occupational physicians (practicing occupational physicians who provide occupational health services for multiple companies or business places), or university instructors in charge of occupational health who had graduated from the University of Occupational and Environmental Health and who had a career of at least 3 years as occupational physicians. In total, 104 individuals who met the requirements were selected by the personal connection method, and they were provided with an outline of the study and the participation requirements via e-mail and asked to participate. Participants were required to respond within 1 week to all 3 rounds of the questionnaire survey, which were scheduled in advance. Eighty-three individuals consented to participate in
In the first round of the questionnaire survey, participants were asked to provide information on 1) personal attribute (name, career as an occupational physician, history of clinical experience, etc.), 2) whether to consider limitation of work based on values of a single parameter among medical examination parameters, and 3) the actual value of each laboratory parameter triggering consideration of limitation of work. For the second item, general medical examination parameters based on the Industrial Health and Safety Act [systolic blood pressure (SBP), diastolic blood pressure (DBP), hemoglobin (Hb), Red Blood Cell count (RBC), aspartate aminotransferase (AST), alanine aminotransferase (ALT), γ-glutamyl transpeptidase (γGTP), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDLC-C), triglyceride (TG), fasting plasma glucose (FPG), post-prandial plasma glucose (PPG), hemoglobin A1c (HbA1c (JDS)) and certain additional parameters determined by medical examinations conducted by several companies [body mass index (BMI), platelet (Plt), creatinine (Cre), and uric acid (UA)], a total of 17 parameters, were included. For the third item, the number of parameters was restricted to the following 9 to reduce the burden on participants responding to the questionnaire: SBP, DBP, Hb, ALT, LDL-C, FPG, PPG, HbA1c, and Cre. For the second and third rounds, participants received the same questionnaire as for the first round plus a graphic representation of the results of the previous survey, and they were requested to provide responses for the second and third items again while referring to the results of the previous survey. The first questionnaire was sent on November 5, 2012, and the reply deadline was November 12, 2012. The second questionnaire was sent on November 22, 2012, and the reply deadline was November 29, 2012. For the third survey, the questionnaire was sent on December 10, 2012, and the reply deadline of December 17, 2012. In the event of any omissions or descriptive errors, contact was made directly with the respondent to verify the contents (Fig. 1).

As a result of discussion regarding the criteria for consensus, which were discussed at the meeting of the study group, consensus was regarded as having been reached when at least 50% of respondents provided a response to the second item indicating that limitation of work would be considered independently for a single medical examination parameter. In addition, for the third item, the values of the respective parameters that would merit consideration of limitation of work were determined by the most frequently proposed values, but the distribution of proposed values was positioned as additional consensus information.

Results

Valid responses were obtained for the first to third rounds of the survey from all 83 individuals who showed interest in participating in this study.

In regard to personal attribute, the participants had been occupational physicians for 9.40 years on average, and their mean duration of clinical experience was 5.49 years. The career duration as an occupational physician was most frequently between 4.9 and 9.9 years, which was reported by 42 (50.6%)
participants; the duration of clinical experience was most frequently 4.9 years, as reported by 49 (59.0%) participants. In total, 52 (62.7%) participants were occupational health specialists accredited by the Japan Society for Occupational Health. Regarding their current occupational physician activities, there were 56 (67.5%) exclusively full-time occupational physicians and 27 (32.5%) contract occupational physicians (Table 1a, 1b, Fig. 2).

Results of the first to third rounds of the survey

At least 50% of the respondents agreed that values of a single parameter, from among the common medical examination parameters, would merit consideration of limitation of work if the value was for one of the following 10 parameters: SBP, DBP, Hb, AST, ALT, FPG, PPG, HbA1c (JDS), Plt, or Cre. Therefore, the most frequently proposed criterion value for LDL-C was not recorded.

Results of the second round of the survey

Among the common medical examination parameters, at least 50% of respondents agreed that each of the following 9 parameters could serve as a single parameter that would independently merit consideration of limitation of work: SBP, DBP, Hb, AST, ALT, FPG, PPG, HbA1c (JDS), and Cre. The most frequently proposed criterion values for considering limitation of work for these 9 parameters were the same as in the first round and were as follows: 180 mmHg (87.8%) for SBP, 110 mmHg (83.1%) for DBP, 200 U/l for ALT (53.4%), 200 mg/dl (63.1%) for FPG, 300 mg/dl (76.9%) for PPG, 10% (73.6%) for HbA1c (JDS), 8.0 g/dl (52.1%) for Hb, and 2.0 mg/dl (61.7%) for Cre. Only 32.5% of respondents reached agreement for LDL-C as a single parameter that would merit consideration of limitation of work, the same as in the first round. Therefore, the most frequently proposed criteria value for LDL-C was not recorded.

Results of the third round of the survey

Among the common medical examination parameters, at least 50% of respondents agreed that each of the following 9 parameters could serve as a single parameter that would independently merit consideration of limitation of work if the value was for one of the following 10 parameters: SBP, DBP, Hb, AST, ALT, FPG, PPG, HbA1c (JDS), and Cre. The most frequently proposed criterion values for considering limitation of work for these 9 parameters were the same as in the first round and were as follows: 180 mmHg (87.8%) for SBP, 110 mmHg (83.1%) for DBP, 200 U/l for ALT (53.4%), 200 mg/dl (63.1%) for FPG, 300 mg/dl (76.9%) for PPG, 10% (73.6%) for HbA1c (JDS), 8.0 g/dl (52.1%) for Hb, and 2.0 mg/dl (61.7%) for Cre. Only 32.5% of respondents reached agreement for LDL-C as a single parameter that would merit consideration of limitation of work, the same as in the first round. Therefore, the most frequently proposed criteria value for LDL-C was not recorded.
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The most frequently proposed criterion values for considering limitation of work for these 9 parameters were the same as in the first round and were follows: 180 mmHg (86.6%) for SBP, 110 mmHg (85.9%) for DBP, 200 U/l (61.6%) for ALT, 200 mg/dl (69.1%) for FPG, 300 mg/dl (76.9%) for PPG, 10% (62.3%) for HbA1c, 8.0 g/dl (58.5%) for Hb, and 2.0 mg/dl (67.2%) for Cre. Only 30.1% of respondents reached agreement for LDL-C as a single parameter that would merit consideration of limitation of work. Therefore, the most frequently proposed criterion value for LDL-C was not recorded.

Discussion

In Japan, employers are legally obligated to implement measures for their employees at work based on the results of general medical examinations for their employees and, in compliance with the advice of a physician. However, the advice provides by physician should be based on the relationships between work-related factors, such as the work environment and work method, and worker-related factors, such as the health status of individual workers. Because there are numerous and complex combinations of these factors, no criteria have yet been established that can serve as the grounds for making judgments. We collected the recommendations of occupational physicians to employers regarding limitation of work for their employees, and classified them based on limitation of work according to its purpose and basis. In this study, we conducted a survey using the Delphi method to determine expert consensus values that could be used as references for physicians in considering limitation of work in cases in which the current illness is poorly controlled and difficult to manage for work-related reasons.

Selection of laboratory parameters

To identify which laboratory parameters merit consideration of limitation of work as a single parameters, BMI, Plt, Cre, and UA were added to the general medical examination parameters. These additional parameters were selected by employing comprehensive judgments based on tests showing that these parameters were being measured in several companies, that they served as indices of organ damage including liver and renal dysfunction and were applicable for determining whether to recommend limitation of work, and that their addition to special health check-ups targeting lifestyle-related diseases in the public was under discussion. In regard to reference values triggering limitation of work, the survey was restricted to 9 parameters (SBP, DBP, Cre, LDL-C, ALT, FPG, PPG, HbA1c, Hb), considering the burden on respondents. As a representative of AST, ALT, and γGTP, which were expected to overlap clinically, AST was chosen because it is used as a criterion for treatment of viral hepatitis, as prescribed by the Japan Society of Hepatology. As an index of lipid metabolism disorders, LDL-C, which is known to be associated with substantial accumulation of clinical evidence, was chosen. Regarding anemia examination, Hb was chosen because, in general, anemia is often evaluated in terms of Hb. As parameters of blood pressure and blood sugar tests, SBP, DBP, FPG, PPG, and HbA1c were all chosen because each is independently associated with clinical criteria. Cre was also added because it is an important index of chronic renal impairment.

Significance of consensus for various diseases and laboratory parameters

The parameters for which at least 50% of respondents agreed that a single parameter would independently merit consideration of limitation of work were those that indicate hypertension, abnormal glucose metabolism (diabetes mellitus and hypoglycemia), hepatic impairment, and anemia. In particular, higher accumulation was recognized for blood pressure than for other parameters. It is assumed that respondents were considering the possibility that a temporary increase in blood pressure might cause adverse effects such as cardiovascular disease because blood pressures are more likely to vary during work than other parameters. From this viewpoint, cases more like those in which continuation of the current work may aggravate the employee’s health impairment (type 1), rather than those in which the current illness is poorly controlled and difficult to manage for work-related reasons (type 3), may be present.

In regard to glucose metabolism, agreement regarding HbA1c 10% was predominant, but there was another accumulation of responses that peaked at the HbA1c value of 8%. Although there is no evidence or guideline regarding HbA1c 10%, it is inferred that this value is a clear-cut figure readily explainable to both companies and employees as unacceptable from the standpoint of being a parameter that is necessary and appropriate for companies to monitor for the safety of employees. It seems that HbA1c 8%, which has been established as the borderline of therapeutic success in clinical guidelines, was consciously proposed by physicians given the strict glycemic control required depending on the type of job. Accumulation of responses for preprandial and postprandial blood glucose levels was noted, but the percentages of agreement were lower than those for
Fig. 3. The most frequently proposed criterion values for considering limitation of work.
of accumulation of responses for the most frequently proposed criterion value varied more widely than those for other parameters during the Delphi survey conducted in this study (ALT 200 U/l: 33.3% → 61.6%). Measures aimed at enhancing health management of patients with hepatic impairment in the workplace include rest, salt restriction, and restriction of protein intake.

When Hb abnormalities are identified by medical examination, most cases have hypoferric anemia. Although the recommended cutoff Hb value for hypoferric anemia screening is 13 g/dl for men and 12 g/dl for women, in contrast to hepatic impairment cases, there are no established criteria for treatment. Therefore, the percentage of accumulation of responses for the most frequently proposed criterion value varied greatly, as the physicians were affected by the opinions of others (Hb 37.3% → 58.5%). Because anemia causes light-headedness and malaise, affecting work performance, it is important to link the test results to treatment. Therefore, as with hypoglycemia, physician advice is considered to be related to type-2 context.

Regarding creatinine, a guideline for the estimated glomerular filtration rate (eGFR), as calculated by an established formula, has recently been recommended. A Cre level of 2.0 mg/dl or higher roughly corresponds to G3b (a moderate to severe decrease in renal function), although there are variations depending on the height, weight, and age of the subject. This condition necessitates dietary restrictions, such as reducing potassium and protein intakes, together with moderate exercise. Thus, it is important for the affected individual to follow all lifestyle-related recommendations. Therefore, limitation of work, based on the type-3 context, would appear to be necessary.

The laboratory parameter for evaluating dyslipidemia did not achieve sufficient agreement as a single parameter that would independently merit consideration of limitation of work. Because this parameter does not directly cause health impairment, unlike the other parameters examined, and instead is only a predictive risk factor, it is presumed that it minimally motivates physicians to recommend strict treatment by aggressively calling for limitation of work.

Precautions in the application of consensus information

It should be borne in mind that the consensus information obtained in this study only provides values that merit consideration of limitation of work and that exceeding the reference values does not necessarily mean that the worker in question would be subject to limitation of work. Limitation of work can lead to
limitation of the worker’s right to work, and therefore requires cautious application. More specifically, because the combinations of work-related factors and worker related factors are numerous and complex, as mentioned previously, it is important to make the final judgment according to the current status of the individual worker after collecting information on the situation of the workplace and the actual working status of the worker through interviews with the person in question, his or her supervisor, and other relevant individuals. The type-3 response, i.e., the response to cases in which the current illness is poorly controlled and difficult to manage for work-related reasons, aims to prevent health impairment in the relatively near future. Therefore, more flexible measures such as the following should be considered: limitation of work is suspended for a certain period; suspension of limitation of work for a certain period, encouragement of adequate consultation behaviors and improvement of lifestyle habit, and reversal of the limitation of work recommendation if there is improvement.

Limitations of this study

This study was limited by the attributes of the participants. Due to the nature of the Delphi method, the collection rate in each round of the survey had to be enhanced. Therefore, the study participants were restricted to alumni of the School of Medicine, University of Occupational and Environmental Health, i.e., our own institution, because the questionnaires were easier to collect from these physicians. Because of this limitation, criteria for making judgments might have been biased. The participants might also have included physicians with insufficient experience who would thus possibly not be suitable for the purpose of obtaining consensus in an expert group, because those who had no more than 10 years of experience as occupational physicians accounted for a relatively high proportion, 63.9%, and physicians not accredited as occupational health specialists accounted for 37.3%. Among the parameters that achieved at least 50% agreement, those for which criterion values were proposed with high percentages of accumulation were defined as parameters with high consensus according to the definition used by our study group. Although PPG provided a criterion value with the third highest accumulation of response, the percentage of accumulation of response did not necessarily give weight to the relevance of this parameter, considering that a relatively low percentage of participants cited PPG as a single parameter that would independently merit consideration of limitation of work.

The study design itself is another limitation. As has been discussed, work related factors, which should naturally be taken into account when considering limitation of work, were not included in this survey. Given its limitations, caution is necessary when applying the results of this study.

Conclusion

To support physicians who give advice to employers about work-related measures based on the results of general medical examinations of employees, expert consensus information was obtained that can serve as background material for making judgements. It is expected that the use of this information will facilitate the ability to take approach measures after medical examination of employees.

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