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1 Original article

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3 **Information exchange using a prescribed form and involvement of occupational health**
4 **nurses promotes occupational physicians to collaborate with attending physicians for**
5 **supporting workers with illness in Japan**

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7 Go MUTO* † 1, 2, Rina Ishii NAKAMURA*1, Kazuhito YOKOYAMA†1, Fumihiko

8 KITAMURA1, Yuki OMORI3, Masahiko SAITO4, Motoki ENDO5, 6

9 *These authors have contributed equally to this work.

10

11 1) Department of Epidemiology and Environmental Health, Juntendo University Faculty of

12 Medicine, Tokyo, Japan

13 2-1-1, Hongo, Bunkyo-ku, Tokyo, 113-8421, Japan

14 2) Department of Global Health and Population, Harvard T.H. Chan School of Public Health,

15 Boston, USA

16 665 Huntington Avenue, Building 1, Room 1210, Boston, MA, 02115, USA

17 3) Department of Hygiene, Kitasato University School of Medicine, Japan

18 1-15-1, Kitazato, Minami-ku, Sagamihara-shi, Kanagawa, 252-0374, Japan

19 4) Hoshizaki Clinic of Daido Steel Co., Japan

20 2-30, Daido-cho, Minami-ku, Nagoya-shi, Aichi, 457-8545, Japan

21 5) Department of Public Health, Tokyo Women's Medical University, Tokyo, Japan

22 8-1, Kawadacho, Shinjuku-ku, Tokyo, 162-8666, Japan

23 6) Department of Public Health, Juntendo University Faculty of Medicine, Tokyo, Japan

24 2-1-1, Hongo, Bunkyo-ku, Tokyo, 113-8421, Japan

25

26 †Corresponding Author : Kazuhito YOKOYAMA, and Go MUTO

27 Department of Epidemiology and Environmental Health, Juntendo University Graduate School of

28 Medicine, 2-1-1, Hongo, Bunkyo-ku, Tokyo, 113-8421, Japan

29 Telephone: 81-3-5802-1047, FAX: 81-3-3812-1026

30 e-mail: kyokoya@juntendo.ac.jp

31 : g-muto@juntendo.ac.jp

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33 Short running title:

34 **COLLABORATION ON OCCUPATIONAL AND ATTENDING PHYSICIANS**

35

36

37 **Abstract**

38 **Objective:** The maintenance of a balance between work and disease treatment is an important issue in Japan.

39 This study explored factors that affect collaboration between occupational physicians (OPs) and attending
40 physicians (APs).

41 **Methods:** A questionnaire was mailed to 1,102 OPs. The questionnaire assessed the demographic
42 characteristics of OPs; their opinions and behaviors related to collaboration, including the exchange of
43 medical information with APs; and the occupational health service system at their establishments.

44 **Results:** In total, 275 OPs completed the questionnaire (25.0% response rate). Over 80% of respondents
45 believed OPs should collaborate with APs. After adjusting for company size, collaboration ≥ 10 times/year
46 (with regard to both returning to work following sick leave and annual health check-ups for employees) was
47 significantly associated with environmental factors, such as the presence of occupational health nurses (odds
48 ratio (OR): 5.56 and 5.01, respectively, $p < 0.05$) and the use of prescribed forms for information exchange
49 (OR: 4.21 and 3.63, respectively, $p < 0.05$) but not with the demographic characteristics of the OPs ($p > 0.05$).

50 **Conclusions:** The majority of OPs believed that collaboration with APs is important for supporting workers
51 with illnesses. Support systems including prescribed forms of information exchange and occupational
52 health nurses, play pivotal roles in promoting this collaboration.

53

54 **Key words:** Occupational physicians, Occupational health nurses, Collaboration, Information exchange,

55 Balance between work and disease treatment, Return-to-work, and Follow-up of annual health check-ups

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59 **Introduction**

60 Recently, the maintenance of a balance between work and disease treatment has become a major social issue
61 in Japan because of the aging labor force and low birth rate¹⁻⁵). Collaboration between attending
62 physicians (APs) and occupational physicians (OPs) is important for supporting workers with mental and/or
63 physical illnesses³⁻⁶). In 2016, the Japanese Government and the Ministry of Health, Labour, and Welfare
64 of Japan published guidelines for balancing work and disease treatment in the workplace⁶). According to
65 these guidelines, collaboration between OPs and APs through employee-approved medical information
66 exchange is important.

67 Such collaboration has two major goals: to ensure that treatment is accessible to employees and to
68 allow employees to continue working despite their illness⁶⁻¹¹). The former goal includes providing
69 educational support to workers with non-communicable diseases, such as diabetes, helping them adhere to
70 treatment recommendations, and preventing future complications⁶⁻⁹). The Clinical Guide for Diabetes
71 issued by the Japan Diabetes Society (2016)⁹) recommends collaboration between APs (diabetes specialists)
72 and OPs. The latter goal includes supporting the return to work of patients with chronic diseases, such as
73 cancer, mental health disorders, and stroke^{3-6, 10, 11}). **One of the integral roles of OPs are the**
74 **assessment and management for employees' fitness for work in order to identify any difficulties**
75 **resulting from diseases suffered, which could occur when workers hope to return to work¹²⁻¹⁴).**
76 **OPs play indispensable roles in evaluating the fitness for work for specific tasks, ensuring a**

77 satisfactory fitness between workers and their jobs, and enabling them to undertake their work
78 safely and effectively. In this context, exchanging information on workers' health condition is
79 essential for OPs, and collaboration between OPs and APs is one of the most important support systems for
80 employees on sick leave who want to return to work¹¹⁻¹⁸). Information provided by APs is beneficial to
81 OPs and allows them to adjust workplace environments according to the employee's specific needs and
82 disabilities¹⁰⁻¹⁵).

83 The importance of collaboration between OPs and APs has been highlighted in European countries,
84 where primary healthcare and occupational health are integrated¹⁹⁻²⁸). In 2010, the United Kingdom
85 implemented the Statement of Fitness for Work (Fit Note)²⁹), which stipulates that general practitioners
86 (GPs) provide support to workers who wish to return to work following sick leave; its focus is on facilitating
87 the integration of their diseases or disabilities into their work³⁰⁻³²). Based on a survey in the United
88 Kingdom, GPs showed low levels of interest in collaboration, possibly due to a lack of knowledge or
89 confidence³¹). However, a past study from France noted that the majority of GPs had positive opinions
90 regarding collaboration¹⁹). Therefore, several educational workshops have been implemented to help GPs
91 achieve ideal outcomes from the Fit Note³³⁻³⁶).

92 Collaboration between OPs and APs is most effective for the purpose of early returning to work as
93 well as for preventing non-communicable diseases^{15-18, 37}). Several European studies explored the impact
94 of collaboration on early return to work in patients with cancer¹⁵), mental disorders¹⁶), and musculoskeletal

95 disorders ^{17, 18)}. Three randomized control trials (RCTs) on mental disorders and orthopedic diseases
96 demonstrated the effectiveness of collaboration for shortening the illness-related absence period ¹⁶⁻¹⁸⁾.
97 However, one RCT evaluating female cancers did not show a significant benefit, which may be explained by
98 the small sample size ¹⁵⁾. From the perspectives from an article in Japan, multifaceted interventions
99 including collaboration improved adherence to diabetes treatment recommendations ³⁷⁾. Based on these
100 results, collaboration between OPs and APs is highly recommended in the Clinical Guide for Diabetes
101 formulated by the Japan Diabetes Society (2016) ⁹⁾. However, several studies have shown that current
102 models of collaboration are not effective and require improvement ^{19, 20, 38-41)}. Specific barriers may
103 explain this ineffectiveness; for example, APs may have a poor understanding of OP roles, or support
104 measures may be insufficient for APs and OPs ^{5, 19, 39, 40)}. Support systems for APs, including an
105 educational introduction to Fit Note and access to medical social workers, are known to promote
106 collaborative behavior ^{5, 34, 36, 39, 40, 42)}. However, although a past report showed that occupational health
107 nurses play a supportive role for OPs with respect to health promotion activities at Japanese worksites, it
108 remains unclear whether similar support systems facilitate collaborative behavior by OPs ⁴³⁾. Based on
109 these studies, we formulated the following hypotheses. First, collaborative attitudes on the parts of OPs
110 may be associated with supportive measures, such as the involvement of occupational health nurses and
111 information exchange. Second, these measures may be independent of the size of worksites or the
112 demographic characteristics of the OPs.

113 The primary objective of this cross-sectional study was to determine how support systems and other
114 factors affect OP collaborative behavior toward APs. Additionally, we explored whether guidelines, which
115 may be also useful at small worksites, promoted communication and encouraged collaboration between APs
116 and OPs. Therefore, the aims of this study is to identify factors that may affect collaboration between OPs
117 and APs.

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121 **Subjects and Methods**

122 *Data Collection*

123 An anonymous questionnaire was mailed to 1,102 all the members of the Expert Community of
124 Occupational Health Physicians of the Japan Society for Occupational Health in November 2015. This
125 society is the largest academic organization of occupational medicine in Japan and the members of its expert
126 community of occupational health physicians are professionals including full-time occupational physicians,
127 part-time occupational physicians whose specialty is occupational medicine, and occupational medicine
128 researchers working as part-time occupational physicians. Therefore, this cohort depicts the opinions and
129 behavior of professional occupational physicians in Japan. The questionnaire focused on opinions and

130 behaviors related to collaboration, including the exchange of medical information, between OPs and APs as
131 well as on corporate occupational health service systems.

132 Questions addressed the demographic characteristic of OPs, and eight items solicited their opinions
133 toward collaboration with APs (see Table 2) in the service of supporting employees' return to work
134 following sick leave, preventing diseases, and facilitating collaboration. Each question relied on a four-
135 point Likert scale consisting of 'strongly agree,' 'agree,' 'disagree,' and 'strongly disagree.'

136 The questionnaire also addressed the OPs' workplaces and support measures (see Table 3), including
137 company size, the presence of occupational health nurses, and the circumstances under which companies
138 require OPs to collaborate with APs. Furthermore, in order to evaluate the behaviour of collaboration with
139 APs, the frequencies of collaboration was examined under the situation of their return-to-work and of
140 examining their annual health check-ups. Collaboration and/or medical information exchange was defined
141 as the exchange of documents or face-to-face/telephone communication about various topics, including
142 employees' medical conditions, medications, and plans for treatment or return to work. **Since many OPs,**
143 **especially part-time OPs may work for several companies at the same time in Japan, we instructed**
144 **respondents of the questionnaire to select one specific workplace at their wills and answer all the other**
145 **questions in the same specific workplace such as the presence of occupational health nurses or prescribed**
146 **forms for collaboration. Based on this instruction, respondents of this questionnaire answered actual**
147 **collaborative times of information exchange with employees' APs per year, which enabled us to analyze**

148 collaborative behavior and its related supportive factors precisely. The Research Ethics Committee for the
149 Faculty of Medicine at Juntendo University approved this study (No.2015076). All the participants of this
150 study were informed and consent on documents to the purposes of the research.

151

152 *Statistical Data analysis*

153 To examine the factors affecting the annual frequency of collaboration between OPs and APs, answers
154 submitted by retired OPs were excluded from the statistical analyses (Table3 and 4). We divided
155 respondents into two groups according to the presence or absence of several factors and compared the
156 difference in the frequency of collaboration between the two groups using a t-test. Logistic regression
157 analysis was also used to calculate the odds ratios (ORs) with confidence intervals (CIs) for collaboration
158 with APs more than or equal to 10 times per year. We set the cutoff value as 10 because the average and
159 standard deviation of the distribution of collaboration times a year in returning-to-work was 9.2 and 10.1
160 respectively, and in health check-ups they were 12.5 and 11.7 respectively. In this analysis, the values of
161 the odds ratios were adjusted for company size, and the data were converted into a binomial format
162 depending on the number of employees (>500 employees = 1 and <500 = 0). Our rationale for this
163 approach was that larger companies, with more than 1,000 workers, generally have occupational health
164 support due to legal requirement in Japan (34, 35), which may be a confounding factor. From our
165 database, the percentages of the presence of occupational health nurses in small and large sized companies

166 were 48.9 % and 95.6 % respectively if the cutoff value was 500, while they were 63.4 % and 96.6%
167 respectively if the cutoff value was 1,000. Therefore, we set the cutoff value was to be 500 in order to
168 highlight the influence by the difference of presence or absence of supportive system. OP experience was
169 converted into a binomial value (>10 years = 1 and <10 years = 0). As for opinions about collaboration,
170 answers as 'strongly agree' were compared to other answers in order to contrast OPs ideas more clearly.
171 Analyses were performed IBM SPSS Statistics 22.

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173

174 **Results**

175 In total, 275 OPs completed the questionnaire (response rate of 25.0%). Table 1 presents participants'
176 characteristics about their personal and professional information. Males accounted for three-quarters of the
177 respondents. The most common length of experience for medical physicians was 21–30 years, followed by
178 > 30 years. The length of experience among OPs was most commonly ≤ 10 years, followed by 11–20
179 years. Approximately 60% of respondents were Occupational Health Physicians certified by Japan Society
180 for Occupational Health. Additionally, approximately 55% of respondents were certified as Occupational
181 Health Consultants through the Ministry of Health, Labour, and Welfare of Japan, while approximately 30%
182 of respondents lacked either certification. The questionnaire revealed that 48% of participants were
183 certified as Clinical Medicine specialists (Internal Medicine, 25.5%; Surgery, 11.6%), whereas 54% of

184 participants were not. Additionally, we found that the OP respondents predominantly worked part-time;
185 this was followed by those who worked full-time or were retired.

186 Table 2 shows the responses from 275 OPs regarding collaboration with APs to support and
187 enable employees to maintain a balance between work and disease treatment. The majority of OPs had
188 affirmative opinions regarding the necessity and value of collaboration with APs in several situations,
189 including the return to work following sick leave and the prevention of disease exacerbation. Furthermore,
190 approximately 90% of respondents had positive views about the importance of occupational health nurses
191 and other occupational health staff members and valued the development of strong relationships with APs.
192 Most respondents believed that APs would be more likely to collaborate with OPs if the National Health
193 Care Service Systems provided compensation.

194 To increase our understanding of the dynamics of collaboration between OPs and APs, the
195 number of collaborations per year and affecting several factors were analyzed as shown in Table 3. This
196 enabled us to compare the tendency of collaboration behavior between different groups of OPs. We
197 hypothesized that collaboration was influenced by the individual backgrounds of OPs, such as their length of
198 experience as an OP and whether they had a specialization in Occupational or Clinical Medicine.
199 However, the specific demographic characteristics of the OPs were not associated with the frequency of
200 collaboration. Respondents who strongly agreed with the importance of collaboration between APs and
201 OPs regarding workers returning to work following leave for mental health disorders and with the usefulness

202 of collaboration to prevent exacerbation of diseases collaborated more frequently. On the other hand,
203 strongly positive opinions regarding the importance of collaboration about individuals returning to work
204 following a physical disease and the usefulness of collaboration for improving the effectiveness of treatment
205 were not associated with collaboration frequency. Additionally, most support measures for OPs at
206 companies were significantly associated with the frequency of collaboration. These support measures
207 included the size of the company, the involvement of occupational health nurses, and the presence of specific
208 prescribed forms for collaborating in cases of employees returning to work following sick leave and
209 preventing disease exacerbation. However, we found that company-mandated AP–OP collaboration did
210 not result in more collaboration than that did the absence of such mandates.

211 **In order to adjust for company size, which can be a confounding factor against collaboration**
212 **frequency, we used a logistic regression model.** Table 4 shows the adjusted odds ratios (ORs) with 95%
213 confidence intervals (CIs) for collaborating (i.e., information exchange) at least 10 times per year about
214 employees returning to work following sick leave and about annual health check-ups. We observed a
215 significant relationship between the frequency of collaboration between OPs and APs and the former’s
216 positive opinions about the importance of collaboration for employees returning to work with mental health
217 disorders and/or physical diseases (OR: 2.43, 95% CI: 1.19–4.95; OR: 2.23, 95% CI: 1.21–4.12,
218 respectively). In terms of collaboration about annual health check-ups, there were also significant
219 associations between the frequency of collaboration and the OPs’ positive opinions regarding the importance

220 of collaboration to prevent disease exacerbation and to establish a good relationship with APs (OR, 2.04,
221 95% CI: 1.14–3.65; OR, 1.89, 95% CI: 1.06–3.36, respectively). Surprisingly, several environmental
222 factors (e.g., support for OPs) had a stronger effect on collaboration than did the factors discussed
223 previously. Collaboration related to returning to work was significantly associated with the presence of
224 occupational health nurses and the presence of prescribed forms for collaboration about returning to work
225 (OR: 5.56, 95% CI: 1.20–25.8; OR: 4.24, 95% CI: 2.01–8.82, respectively). Collaboration during annual
226 health check-ups was also significantly related to the presence of occupational health nurses and the presence
227 of prescribed forms for collaboration to support disease prevention or exacerbation (OR: 5.01, 95% CI: 1.37–
228 18.3; OR: 3.63, 95% CI: 1.94–6.79, respectively). By contrast, other factors (e.g., the backgrounds of OPs)
229 were not associated with collaboration. As shown above, environmental factors, such as the involvement
230 of occupational health nurses and guidelines including prescribed forms for collaboration, exerted significant
231 effects that were independent of those exerted by company size.

232

233 **Discussion.**

234 This is the first report showing that support measures for OPs, such as guidelines including prescribed forms
235 for information exchange and the involvement of occupational health nurses, play important roles in
236 fostering collaboration with APs. More importantly, these measures increased the frequency of
237 collaboration regardless of company size **as illustrated in Table 4**. These support measures were effective

238 in situations such those involving employees returning to work and follow-up of annual health check-ups.

239 Furthermore, collaboration frequency was more strongly affected by these factors than by the opinions of

240 OPs and APs. The individual demographic characteristics of OPs, including their experience and specialty,

241 were not associated with collaboration frequency. As for the measurement of collaboration frequencies,

242 data in Table 3 were strongly influenced by working hours as OPs because we did not adjust them. It is

243 true that most items regarding environmental factors shown in category III in Table 3 were influenced by

244 working hours as OPs, working type as OPs (full-time or part-time), and company size. On the other hand,

245 most items about OPs' individual background as category I and opinions about collaboration as category II

246 in Table 3 were not associated with these factors since there were no difference in distribution of working

247 hours, working type, and company size between two groups of respondents of Yes or No for corresponding

248 items. In order to standardize of this confounding factor, we adjusted company size when we calculate the

249 adjusted odds ratio in Table 4. One of the main purposes of this research is identifying factors which are

250 determinant for promoting collaboration especially in small sized companies. Therefore, we adjusted

251 company size, which has positive relationship with working hours as OPs, and this enabled us to evaluate

252 frequencies of collaboration without this confounding factor. Our findings suggest that the establishment

253 of a supportive company environment for OPs is the most effective approach to encouraging OPs to

254 collaborate with APs.

255 As shown in Table 2, more than 70% of OPs strongly agreed that collaboration with APs is a
256 necessity; this was viewed as particularly important for employees returning to work following sick leave for
257 mental health disorders and for preparing for medical emergencies. These data may be explained by the
258 implementation of the Japanese Government's Health Care Policy in 2009, which strongly recommends
259 collaboration between OPs and APs as well as the establishment of rehabilitation institutions to support the
260 return of employees with mental health disorders to work. We found that more than 50% of respondents
261 strongly believed that cooperation between OPs and APs is important for supporting the return to work of
262 employees with chronic physical diseases who are receiving treatment as well as for preventing the
263 exacerbation of diseases following health check-ups. Although most OPs recognized the value of
264 collaboration with APs, the frequency of collaboration differed depending on the OP's personal
265 characteristics. While the OP's individual background (e.g., years of experience and specialty) was not
266 associated with the frequency of collaboration, both strongly positive opinions toward collaboration and a
267 supportive corporate environment were significantly associated with collaboration, as shown in Table 3 and
268 Table 4. These results suggest that a positive opinion of collaboration is associated with promoting
269 collaboration between OPs and APs, supporting employees with mental health disorders returning to work,
270 and trying to prevent disease exacerbation following annual health check-ups. These findings are in
271 agreement with several other reports showing that educational interventions were effective in promoting
272 collaborative behaviors among physicians^{5, 34, 36, 39, 40, 42}. **These collaboration between occupational**

273 and clinical medicine comprises cooperation between OPs and other categories of physicians such as
274 specialists, general practitioners, and rehabilitation clinicians^{5, 11, 23-28}). Generally, larger companies
275 have more advanced benefit programs and better systems of occupational healthcare^{43, 44}). In order to
276 accurately evaluate the effect of support measures on collaboration, adjustments for company size were
277 performed using a logistic regression model. These analyses showed that the presence of occupational
278 health nurses and guidelines for collaboration including prescribed forms of information exchange were
279 significantly associated with the frequency of collaboration, even after adjusting for company size, as shown
280 in Table 4. Considering that the adjusted odds ratios (aORs) for support measures were greater than those
281 for highly positive opinions on collaboration, communication facilitation tools, which can be used by OPs to
282 communicate with APs, may be more effective than educational tools for promoting the exchange of
283 information. These results highlight the importance of implementing support measures in the occupational
284 health system. Furthermore, when we adjusted for confounding factors in addition to company size, such
285 as the presence of occupational health nurses and guidelines on collaboration, using multiple logistic
286 regression analysis, we found that the adjusted odds ratios (aORs) for the presence of occupational health
287 nurses and guidelines including prescribed forms with regard to collaboration for the purpose of supporting a
288 return to work were 4.4 (95% CI: 1.0–21) and 3.9 (95% C.I: 1.9–8.2), respectively. Similarly, the adjusted
289 odds ratios (aORs) for following up on annual health check-ups were 3.5 (0.9–13) and 3.3 (1.7–6.1),
290 respectively. The association between the presence of occupational health nurses and health promotion

291 activities at worksites was suggested in a report from Japan⁴³⁾. From the viewpoint of collaboration
292 between workplaces and medical institutions, occupational health nurses play an important role in the
293 cooperative behavior of OPs with APs. From our analysis, occupational health nurses arrange the
294 collaboration such as preparing for information exchange letters or sometimes they accompany employees'
295 visits to APs with letters from OPs, and perhaps write up forms to APs on behalf of OPs (data not shown).
296 These roles of occupational health nurses may be effective in cooperation between OPs and several types of
297 physicians such as specialists and general practitioners in medical institutions or rehabilitation institutions^{5,}
298 ^{11, 23-28)}. As for the presence of prescribed forms of collaboration, it definitely reduces the burden for OPs
299 to write up documents to APs and promote the collaboration behavior. From the facts and considerations
300 above, both occupational health nurses and prescribed forms on collaboration were independent factors
301 associated with increased OP–AP collaboration.

302 It is important for OPs to obtain medical information directly from APs to plan for an employee's
303 return to work and to refer employees to APs (specialists) to prevent disease exacerbation. However, the
304 workload of OPs has increased, partly due to the introduction of the obligatory Brief Job Stress
305 Questionnaire check-ups in Japan. Therefore, efficient and convenient support systems for the exchange of
306 medical information between OPs and APs are required. In our survey, 85.9% of large companies with at
307 least 200 employees had support systems for employees returning to work, whereas only 64.6% of smaller
308 companies with fewer than 200 employees had such support systems available. There may be several

309 barriers to the implementation of new occupational health support systems, such as hiring occupational
310 health nurses, which is especially challenging for small companies due to the high costs. On the other
311 hand, the implementation of guidelines including prescribed forms on information exchange is a promising
312 approach to the promotion of collaboration in view of its low cost.

313 Supervisors must understand employees' health conditions to facilitate the ability of the latter to
314 balance work and disease treatment ⁵⁾. Although the exchange of medical information between OPs and
315 APs is useful for employees, some employees may not want anyone to have access to their health
316 information. Therefore, the guidelines published by the Japanese Government ⁶⁾ emphasize that employee
317 agreement is always required for APs and OPs to exchange medical information. Explicit consent (e.g., a
318 signature on documents outlining information exchange) may remove barriers to medical staffs (including
319 APs) who have their activities restricted by confidentiality issues. Additionally, as of 2017, the
320 government healthcare insurance system in Japan does not provide payment to APs for preparing such
321 documents as a Fit Note. Based on our pilot survey of 282 APs who were members of the Tokyo Medical
322 Association, the average ideal rewards for preparing a document (e.g., a Fit Note) was 3,475 yen (**data not**
323 **shown here, prepared for submitting another articles**). The provision of appropriate rewards to APs for
324 information exchange could improve the collaborative environment.

325 The number of cancer survivors is increasing in Japan, and it is important to provide support for
326 these individuals in both workplaces and medical institutions. In medical institutions, the development of

327 positive attitudes and behaviors by APs (oncologists) in relation to collaborating with patients' workplace
328 depended on the availability of support measures⁵⁾, which was consistent with our results regarding OPs in
329 the workplace. In Japan, the length of the approved sick leave of most employees depends on the
330 company, but most companies guarantee at least 3 to 6 months **if they are regular employment**, after which
331 more than half of patients with gastric, colon, and genital cancers who want to continue their job can return
332 to the workplace³⁾. **For the support of returning-to-work of contractual employment workers, we propose**
333 **that legal requirement be necessary for the guarantee of the same period sickness absence, which enables**
334 **OPs to take advantage of support system for collaboration.** Based on our results, guidelines including
335 prepared fixed documents are definitely useful for employees who are returning to work with these cancers
336 ¹¹⁾. Support measures and collaboration (including with rehabilitation institutions) are also required for
337 stroke survivors⁴⁾. Moreover, OPs can function as generalists in the workplace, as some physical diseases
338 (e.g., chronic musculoskeletal disorders), including mental disorders^{45, 46)}, are strongly associated with
339 psychosocial factors, and cancer survivors often experience mental health issues, such as sleep disorders⁴⁷⁻
340 ⁴⁹⁾. Supportive measures for OPs, such as guidelines including prescribed documents on collaboration, are
341 required to enable them to care for employees with physical and mental disabilities.

342 This study has several limitations. First, as this was a cross-sectional study, causal associations
343 could not be determined. Second, respondents may have provided socially desirable opinions. Thus, our
344 responses may reflect a bias toward social desirability. Third, OPs with positive opinions on collaboration

345 may have been more likely to participate in this study. Thus, it is possible that our results overestimate the
346 awareness and frequency of collaboration. However, the factors affecting collaboration were not affected
347 by these biases.

348

349 **Conclusion.**

350 Although the majority of OPs agreed on the importance of collaboration with employees and APs, the
351 frequency of collaboration varied depending on the supportive measures within the company but not on the
352 individual characteristics of OPs. The presence of support measures, such as occupational health nurses
353 and guidelines including prescribed forms on information exchange and collaboration, plays an important
354 role in fostering a collaborative environment.

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358 **Authors' contributions**

359 G.M. and R.I.N. planned the research for this study, collected information from previous studies, performed
360 statistical analysis, and drafted the manuscript. M.E. was consulted on the questionnaire items. M.S.
361 arranged the study area and was involved in the recruitment of study participants. Y.O. and F.K. advised

362 on data collection, statistical analysis and reviewed the manuscript. K.Y. supervised and provided advice
363 about this study. All authors read and approved the final manuscript.

364

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371

372 **Conflict of interest statement**

373 None declared.

374

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Table 1 Characteristics of 275 occupational physicians.

	n (%)
Gender	
Male	208 (75.6)
Female	67 (24.4)
Experience as a medical doctor (years)	
≤ 10	29 (10.7)
11-20	71 (26.1)
21-30	92 (33.8)
>30	80 (29.4)
Experience as an occupational physician (years)	
≤ 10	119 (43.5)
11-20	89 (32.5)
21-30	53 (19.3)
>30	13 (4.7)
Certification of specialist in occupational medicine	
Senior Occupational Health Physician certified by Japan Society for Occupational Health	77 (28.0)
Occupational Health Physician certified by Japan Society for Occupational Health	93 (33.8)
Occupational Health Consultant certified by Ministry of Health, Labour, and Welfare of Japan	150 (54.5)
None	85 (30.9)
Certification of specialist in clinical medicine	
Internal medicine	70 (25.5)
Surgery	32 (11.6)
Others	30 (10.9)
None	147 (53.5)
Working types as occupational physician	
Full-time	105 (38.2)
Part-time	150 (54.5)
Retired	25 (9.1)

Table 2 Opinions of 275 occupational physicians (OPs) for collaboration with attending physicians (APs) to support employees for balancing work and disease treatment: Number (%)

Items	Strongly agree	Agree	Disagree	Strongly disagree	No answers
(i) OPs should collaborate with employees' APs for supporting their return-to-work after sick leave due to mental disorders.	204 (74.2)	58 (21.1)	10 (3.6)	1 (0.4)	2
(ii) OPs should collaborate with employees' APs for supporting their return-to-work after sick leave due to chronic physical diseases.	163 (59.3)	96 (34.9)	15 (5.5)	0 (0.0)	1
(iii) OPs should collaborate with employees' APs with regard to the support of prevention of their diseases exacerbation.	146 (53.1)	114 (41.5)	13 (4.7)	1 (0.4)	1
(iv) OPs should collaborate with employees' APs with regard to support and preparation for their sudden attacks of diseases in case of emergency.	200 (72.7)	68 (24.7)	6 (2.2)	0 (0.0)	1
(v) OPs should share drug information of employees with their APs toward improving effectiveness of treating chronic diseases.	124 (45.1)	116 (42.2)	30 (10.9)	4 (1.5)	1
(vi) Occupational nurses and other staffs play important roles when OPs want to collaborate with employees' APs.	160 (58.2)	92 (33.5)	20 (7.3)	2 (0.7)	1
(vii) It is important for OPs to know several physicians at medical institutions around OPs' companies and to build good relationships with them in advance.	133 (48.4)	110 (40.0)	26 (9.5)	4 (1.5)	2
(viii) Providing compensation to APs for collaboration with OPs of patients' workplaces by national health care service system would promote this development.	94 (34.2)	100 (36.4)	68 (24.7)	11 (4.0)	2

Table 3 Factors affecting 250 occupational **physicians'(OPs')** times of collaboration per year by information exchange with attending physicians (APs).

Factors	Times of collaboration per year after examining employees' health check-up report ^a		t-test	Times of collaboration per year when employees' returning-to-work ^a		t-test
	Yes ^b (n ^c)	No ^b (n ^c)	P-value	Yes ^b (n ^c)	No ^b (n ^c)	P-value
I Individual background						
Experiences as OPs for more than 10 years	9.28 ± 8.9 (145)	11.58 ± 9.7 (95)	0.066	8.16 ± 7.7 (147)	8.48 ± 8.2 (97)	0.756
Certification of Occupational Health Consultant by Japanese Ministry of Health, Labour and Welfare	10.29 ± 9.2 (140)	11.04 ± 9.8 (67)	0.589	8.96 ± 8.1 (140)	7.63 ± 8.1 (70)	0.259
Certification of Occupational Health Physician by Japan Society for Occupational Health	10.76 ± 9.1 (156)	11.04 ± 9.8 (67)	0.841	9.22 ± 7.5 (156)	7.63 ± 8.1 (70)	0.150
Certification in clinical medicine	10.43 ± 9.6 (117)	10.06 ± 9.0 (129)	0.759	7.92 ± 7.9 (119)	8.65 ± 7.8 (130)	0.469
II Opinions about collaboration with APs						
OPs should collaborate with APs on employees' returning-to-work with mental disorders	10.73 ± 9.4 (176)	8.88 ± 9.0 (65)	0.170	9.01 ± 8.1 (177)	6.57 ± 7.1 (67)	0.030
OPs should collaborate with APs on employees' returning-to-work with chronic physical diseases	10.87 ± 9.6 (138)	9.38 ± 9.0 (103)	0.215	9.15 ± 8.4 (138)	7.37 ± 7.3 (106)	0.083
Collaboration with APs is valuable for OPs to support the prevention of employees' diseases exacerbation	11.53 ± 9.6 (129)	8.73 ± 8.8 (112)	0.019	8.64 ± 8.2 (129)	8.00 ± 7.6 (115)	0.525

Sharing drug information of employee with APs is valuable for OPs to improve the effectiveness of treating chronic diseases.	10.19 ± 9.4 (108)	10.23 ± 9.3 (133)	0.968	8.15 ± 8.0 (111)	8.50 ± 7.8 (133)	0.735
III Environmental factors of companies occupational physicians belong to						
The number of employees is more than 1000	14.13 ± 9.3 (114)	6.70 ± 7.8 (128)	<0.001	11.17 ± 8.4 (116)	5.75 ± 6.4 (129)	<0.001
The number of employees is more than 200	11.77 ± 9.4 (197)	3.36 ± 4.6 (45)	<0.001	9.72 ± 8.0 (200)	2.11 ± 2.6 (45)	<0.001
OPs usually collaborate with employee's AP when his/her employer or supervisor proposes OPs to do so	9.74 ± 9.2 (124)	10.69 ± 9.5 (118)	0.431	8.31 ± 7.7 (124)	8.32 ± 8.1 (121)	0.994
It is always required for OPs to write up a document on judging and support plan about employee's returning-to-work	10.49 ± 9.3 (200)	8.86 ± 9.1 (42)	0.304	8.80 ± 7.7 (201)	6.11 ± 8.2 (44)	0.040
There are occupational nurses	11.85 ± 9.4 (193)	3.69 ± 5.5 (49)	<0.001	9.60 ± 8.1 (196)	3.18 ± 4.1 (49)	<0.001
There are prescribed forms on collaborating with APs in case of employee's returning-to-work	12.45 ± 9.4 (138)	7.22 ± 8.4 (104)	<0.001	11.06 ± 8.1 (142)	4.53 ± 5.6 (103)	<0.001
There are prescribed forms on collaborating with (referring to) APs in case of supporting the prevention of employees' diseases exacerbation	13.45 ± 9.4 (135)	6.10 ± 7.3 (107)	<0.001	10.31 ± 8.2 (136)	5.83 ± 6.6 (109)	<0.001

a: Average ± SD

b: Yes/No means whether the respondents match or agree the corresponding items.

c: The number of respondents. Total numbers of respondents are less than 250 because of no responses.

Table 4 Adjusted odds ratios (ORs) with 95% confidence intervals (CI) for collaboration (information exchange) with attending physicians (APs) ≥ 10 times/year among 250 occupational physicians (OPs) analyzed by logistic regression model.

	Returning-to-work	Follow-up of annual health check-ups
	ORs (95% CI)	ORs (95% CI)
I Individual background		
OPs are male	1.27 (0.65-2.51)	0.88 (0.50-1.67)
Experiences as OPs for ≥ 10 years	0.83 (0.46-1.51)	1.60 (0.90-2.84)
Certification of Occupational Health Consultant by Japanese Ministry of Health, Labour and Welfare	1.65 (0.90-3.00)	0.88 (0.49-1.55)
Certification in clinical medicine	0.72 (0.40-1.31)	1.11 (0.63-1.95)
II Opinions about collaboration with APs		
OPs should collaborate with APs on employees' returning-to-work with mental disorders	2.43 (1.19-4.95)	1.78 (0.93-3.41)
OPs should collaborate with APs on employees' returning-to-work with chronic physical diseases	2.23 (1.21-4.12)	1.58 (0.88-2.82)
Collaboration with APs is valuable for OPs to support the prevention of employees' diseases exacerbation	1.47 (0.82-2.66)	2.04 (1.14-3.65)
Sharing drug information of employee with APs is valuable for OPs to improve the effectiveness of treating chronic diseases.	0.82 (0.45-1.47)	1.00 (0.57-1.77)
It is important for OPs to know several physicians at medical institutions around OPs' companies and to build good relationships with them in advance.	1.71 (0.95-3.09)	1.90 (1.06-3.36)
Providing compensation to APs for collaboration with OPs of patients' workplaces by national health care service system would promote this development.	0.65 (0.35-1.22)	0.94 (0.52-1.71)

III Environment of companies where OPs are working

It is always required for OPs to write up a document on judging and support plan about employee's returning-to-work	1.04 (0.46-2.39)	0.65 (0.29-1.45)
OPs usually collaborate with employee's AP when his/her employer or supervisor proposes OPs to do so	0.85 (0.48-1.53)	0.75 (0.43-1.32)
There are occupational nurses	5.56 (1.20-25.8)	5.01 (1.37-18.3)
There are prepared forms documents on collaborating with APs in case of employee's returning-to-work	4.21 (2.01-8.82)	1.64 (0.88-3.04)
There are prepared forms documents on collaborating with (referring to) APs in case of supporting the prevention of employees' diseases exacerbation	2.28 (1.21-4.30)	3.63 (1.94-6.79)

Values of odds ratios were adjusted for size of the company occupational physicians belong to (binomial, i.e. whether the number of employees is more than 500 or not)