

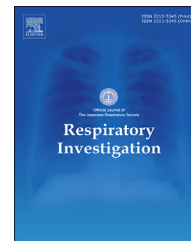


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Original article

The effect of the outbreak of COVID-19 on respiratory physicians and healthcare in Japan: Serial nationwide surveys by the Japanese Respiratory Society



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ABSTRACT

Background: The impact of the outbreak of COVID-19 on the work of respiratory physicians in Japan has not yet been evaluated. The study investigates the impact of the outbreak on respiratory physicians' work over time and identifies problems to be addressed in the future.

Methods: We conducted a web-based survey of respiratory physicians in 848 institutions. The survey comprised 32 questions and four sections: Survey 1 (April 20, 2020), Survey 2 (May 27, 2020), Survey 3 (August 31, 2020), and Survey 4 (December 4, 2020).

Results: The mean survey response rate was 24.9%, and 502 facilities (59.2%) participated in at least one survey. The proportion of facilities that could perform PCR tests for diagnosis and more than 20 tests per day gradually increased. The percentage capable of managing extracorporeal membrane oxygenation (ECMO) or more than five ventilators did not increase over time. The proportion that reported work overload of 150% or more, stress associated with lack of personal protective equipment (PPE), and harassment or stigma in the surrounding community did not sufficiently improve.

Conclusion: While there was an improvement in expanding the examination system and medical cooperation in the community, there was no indication of enhancement of the critical care management system. The overwork of respiratory physicians, lack of PPE, and harassment and stigma related to COVID-19 did not sufficiently improve and need to be addressed urgently.

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1. Introduction

Since the recognition of the first case of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2, COVID-19) infection in Japan in January 2020, the infection has spread throughout the country, and many healthcare institutions and their staff have been exposed to a variety of stresses for long durations – a situation that they have never experienced previously. The shortage of intensive care beds due to the increase in the number of critically ill patients and medical cooperation across hospital departments and facilities have become major topics of discussion. In addition, it has become clear that COVID-19 has a significant impact on healthcare workers' mental health that cannot be ignored, such as prevention and management of burnout due to COVID-19 [1]. Discrimination and stigma against frontline healthcare workers from various parts of the world have been reported as serious problems [2–4].

Many respiratory physicians have been on the front line in the management of COVID-19. However, to date, we have not been able to clarify the following: 1) what role respiratory physicians play in COVID-19 care, 2) how COVID-19 care has affected the work system of each institution and the work content of respiratory physicians (e.g., increase or decrease in total workload, restrictions on regular care, etc.), and 3) what issues respiratory physicians face with COVID-19 care. In addition, respiratory physicians' stress in relation to COVID-19 practice was unclear, 4) whether discrimination and stigma related to COVID-19 occurred around respiratory physicians, and 5) what kind of therapeutic agents were selected in actual clinical practice. The Japanese Respiratory Society, therefore, conducted a nationwide questionnaire survey four times to clarify the aforementioned areas, share the situation and problems encountered nationwide, and provide data for proposing improvements to the medical environment in the future.

2. Materials & methods

We conducted a questionnaire survey of 848 accredited, affiliated, and specified regionally affiliated facilities under the previous Japanese Respiratory Society medical specialty board. The survey was conducted four times between April 2020 and December 2020 (Survey 1: April 20, 2020, Survey 2: May 27, 2020, survey 3: August 31, 2020, Survey 4: December 4, 2020). The status of COVID-19 prevalence in Japan at the time of each survey is illustrated in Fig. 1. We prepared 32 questions to assess the situation related to COVID-19 treatment and obtained responses using a web questionnaire (Table 1). The survey was divided into four parts: Questions about 1) the current status of their institution, 2) the COVID-19 practices that respiratory physicians are responsible for, 3) work-related problems, and 4) the treatment of COVID-19. The questionnaire was completed by one respiratory physician representing each institution.

3. Results

We received responses from 216 facilities (25.5%) for Survey 1, 266 facilities (31.4%) for Survey 2, 221 facilities (26.1%) for Survey 3, and 141 facilities (16.6%) for Survey 4, with an average response rate of 24.9%. A total of 502 facilities (59.2%) participated in this survey at least once.

3.1. Part 1, status of surveyed medical facilities (Q1–14)

Of the 502 medical institutions that responded, 71.9% were hospitals with more than 300 beds. The proportions of medical institutions designated for infectious diseases and those providing outpatient care for returnee contacts generally remained unchanged (Fig. 2A). The proportion of facilities that could perform PCR testing in the hospital and facilities that could perform more than 20 tests per day clearly increased over time (Fig. 2B). The proportion for ventilator management and extracorporeal membrane oxygenation (ECMO) management did not change significantly during Surveys 1–4 (Fig. 2C). The percentage of facilities capable of managing five or more ventilators decreased from 42.1% in Survey 1–31.9% in Survey 4. The percentage of facilities that reported regional cooperation in COVID-19 care showed a gradual upward trend over time, while those that reported cooperation from other departments in the hospital remained unchanged at about 80% from Survey 3 (Fig. 2D).

3.2. Part 2, role of respiratory physicians in COVID-19 management (Q15–24)

The proportion of facilities with experience in treating confirmed COVID-19 cases increased from 65.7% in Survey 1–90.1% in Survey 4. The proportion where more than 76% of confirmed COVID-19 cases were treated by respiratory physicians increased until Survey 3, but then decreased to 41.7% in survey 4 (Fig. 3A). Fig. 3B illustrates the severity of COVID-19

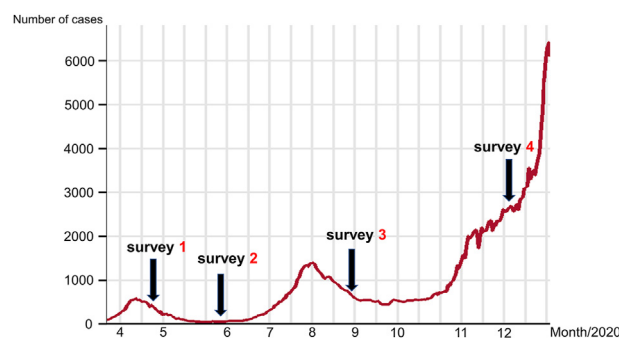


Fig. 1 – Reported daily cases of COVID-19 in Japan. Chart elaborated at <https://www.iancampbell.co.uk/covid-19.php> with data from Johns Hopkins University. The chart is free of copyright. Last accessed March 22, 2021. The definition of case is the number of people who tested positive for SARS-CoV-2 PCR.

Table 1 – The questionnaire.

- Q1. How many beds does your medical facility have?
 Q2. How many full-time respiratory physicians are employed at your medical facility?
 Q3. How many total full-time doctors are employed in your medical facility?
 Q4. Is your medical facility designed for infectious diseases?
 Q5. Does your medical facility provide outpatient care for returnees/contactees?
 Q6. Could your medical facility manage ECMO?
 Q7. How many ECMO units are available in your medical facility?
 Q8. Could your medical facility manage ventilator?
 Q9. How many ventilators are available in your medical facility?
 Q10. Did your medical facility perform SARS-COV-2PCR tests?
 Q11. How many SARS-CoV-2 PCR tests were performed per day in your medical facility?
 Q12. Are there any genetic tests other than PCR that your institution uses to detect SARS-CoV-2?
 Q13. How well does your medical facility obtain cooperation from other departments for the management of COVID-19 patients ?
 Q14. How well does your medical facility have a regional collaboration for the management of COVID- 19 patients?
 Q15. How many suspected COVID- 19 patients are seen per week in the outpatient and emergency care at your medical facility?
 Q16. Does your medical facility have a specific department that manages suspected COVID- 19 patients?
 Q17. What department is responsible for managing suspected COVID- 19 patients in your medical facility?
 Q18. How many confirmed COVID- 19 patients has your medical facility managed in the past?
 Q19. What is the percentage of patients with moderate disease (requiring oxygen) from the total number of confirmed COVID-19 patients in your medical facility?
 Q20. What is the percentage of server disease (requiring ventilator management) from the total number of confirmed COVID-19 patients in your medical facility?
 Q21. In your medical facility, what percentage of patients with confirmed COVID-19 are treated by respiratory physicians?
 Q22. What severity of COVID-19 patients are managed by respiratory physicians?(Multiple answers are acceptable)
 Q23. Is there any change in the workload (including COVID-19) of respiratory physicians when compared to the same period in previous years?
 Q24. Has your medical facility reduced its usual respiratory practice operations due to the COVID-19 pandemic? (Multiple answer are acceptable)
 Q25. At your medical facility, have staff or patients been subjected to harassment (stigma) in connection with COVID-19 clinical care?
 Q26. What kind of harassment (stigma) has occurred in your medical facility due to COVID-19?
 Q27. Are there any plans to change the system of medical care at your medical facility due to COVID-19?
 Q28. How does the role of the respiratory physician change (or has changed) when the medical systems is changed in your medical facility?
 Q29. Which of the following items do you find most stressful when you care for COVID-19 patients at your hospital? (Multiple answers are acceptable)
 Q30. What treatment is provided for mild COVID-19 at your facility? (Multiple answers are acceptable), only Survey 2-4
 Q31. What treatment is provided for moderate II (requiring oxygen therapy) COVID-19 at your facility? (Multiple answers are acceptable), only Survey 2-4
 Q32. What treatment is provided for severe COVID-19 (requiring intensive care) at your facility? (Multiple answers are acceptable), only Survey 2-4

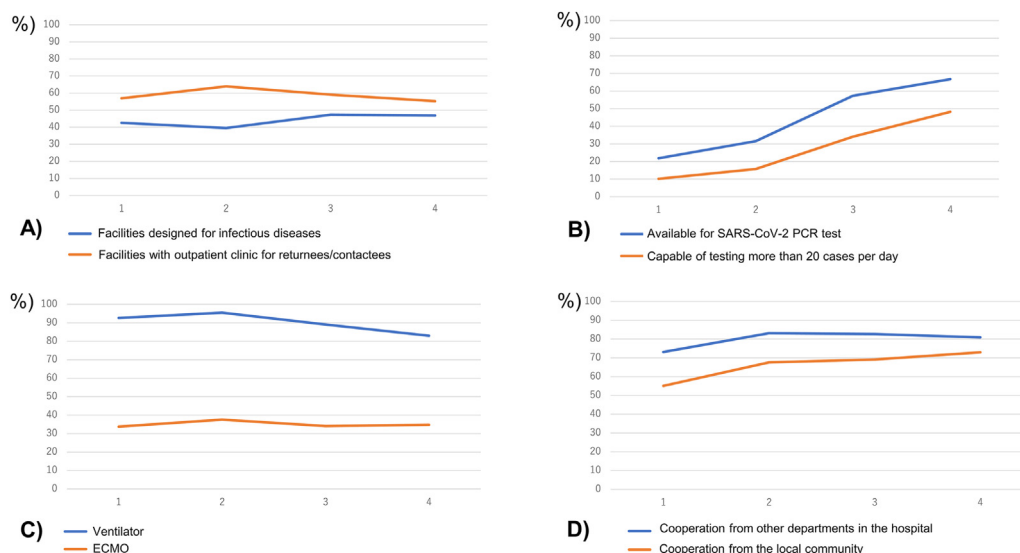


Fig. 2 – Status of surveyed medical facilities. A) Characteristics of participating medical facilities B) Capacity of SARS-CoV-2 PCR test at each facility. C) Availability to manage critically ill patients D) Cooperation from other departments within the hospital and regional collaboration.

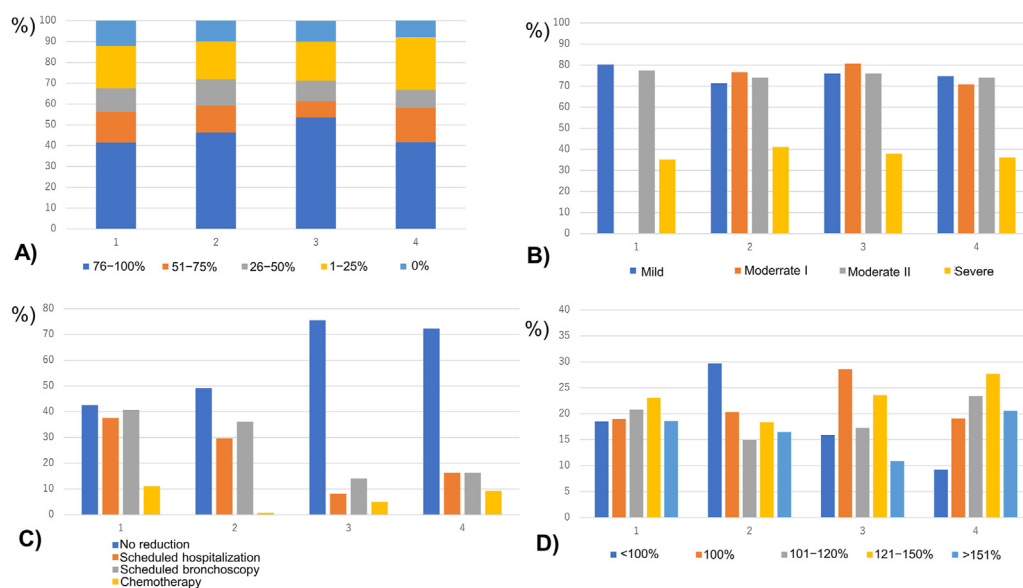


Fig. 3 – Role of respiratory physicians in COVID-19 management and its influence on their routine work. A) Proportion of COVID-19 confirmed cases treated by respiratory physicians B) Severity of COVID-19 treated by respiratory physician in each facility (In Survey 1, moderate I was also counted as mild.) C) Reduction in the routine procedures for respiratory physicians due to COVID-19 D) Workload of respiratory physicians compared with the same period in previous years.

confirmed cases managed by respiratory physicians at each facility. In all the surveys, 70–80% of facilities were in charge of mild, moderate I (no oxygen therapy required), and moderate II cases (requiring oxygen therapy), and 30–40% were in charge of severe cases (requiring intensive care).

The proportion of facilities that reduced the routine respiratory medicine services decreased significantly in Survey 3 but increased slightly in Survey 4 (Fig. 3C). Postponement of scheduled bronchoscopy and hospitalization were the most common routine medical services reduced throughout Surveys 1–4 (Fig. 3C). These decreased significantly after Survey 2, while postponement of chemotherapy did not (Fig. 3C). When evaluating the change in workload, we found that 20.6% of the facilities in Survey 4 showed a serious increase of 150% or more in the workload, which was the worst value in all the surveys (Fig. 3D).

3.3. Part 3, problems in clinical practice (Q25–29)

Fig. 4A presents the issues that stress respiratory physicians the most. Although the proportion of respondents decreased over time, about 30% still felt highly stressed about the increased risk of infection due to lack of personal protective equipment (PPE). Physical fatigue due to increased workload reflected the change in the epidemic situation, while mental fatigue related to collaboration with other departments in the hospital was generally unchanged from Surveys 2–4. The proportion of facilities that reported their staff or patients being subjected to some form of harassment or stigma related to COVID-19 showed a decreasing trend from Surveys 1–3. However, it increased to 21.3% in Survey 4, with no clear improvement from Survey 1 (Fig. 4B). In addition, in Surveys 2–3, these discriminations were more likely to occur outside

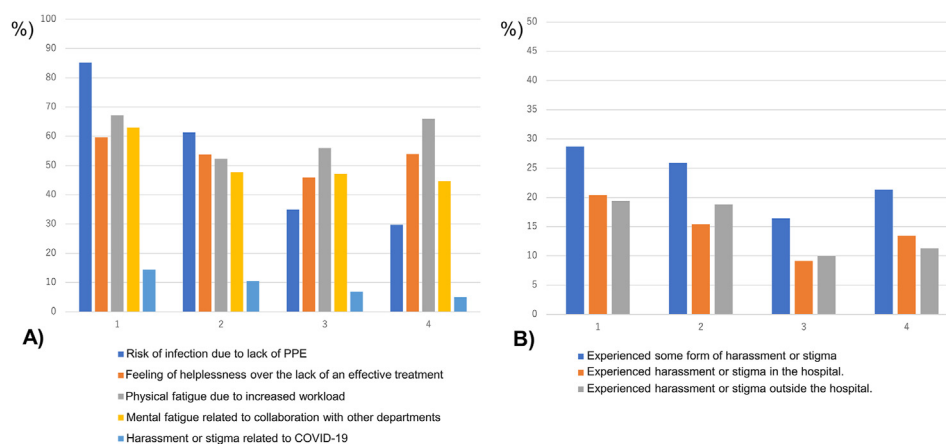


Fig. 4 – Psychological burden of respiratory physicians, harassment, and stigma in the clinical setting. A) Issues that cause stress in respiratory physicians B) Locations where harassment and stigma occur and their rates.

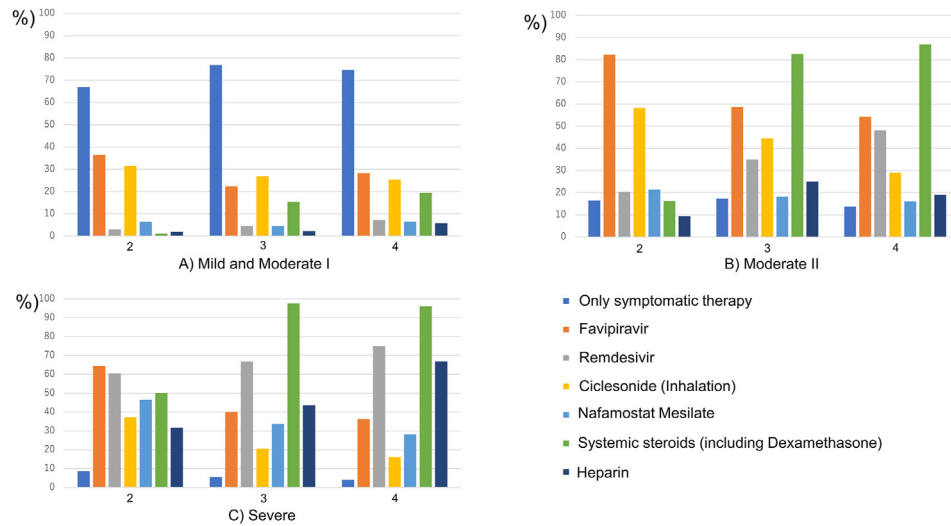


Fig. 5 – Differences in selected therapeutic agents according to the severity of COVID-19. These questions were only investigated between Survey 2 and Survey 4.

the hospital, but in Survey 4, it was more likely to occur inside the hospital (Fig. 4B).

3.4. Part 4, treatment of COVID-19 (Q30–32)

Questionnaires on treatment were performed in Surveys 2–4. For mild and moderate I cases symptomatic treatment alone was the most common, followed by favipiravir and ciclesonide inhalation (Fig. 5A). Systemic steroids were administered in most facilities after Survey 2 for moderate II cases. The proportion of facilities using remdesivir and heparin increased over time, while the proportion using favipiravir and ciclesonide inhalation decreased (Fig. 5B). Systemic steroids were used for treating severe cases in almost all facilities. The proportion using heparin and remdesivir increased over time, and for both drugs, it was higher than that for moderate cases (moderate II). For tocilizumab, the proportion of facilities that reported using it in Surveys 2–4 did not change significantly (Fig. 5C).

4. Discussion

We conducted four surveys at different time intervals for respiratory physicians during the first year of the COVID-19 pandemic in Japan, which was the most chaotic period in the pandemic to date. To identify problems that have improved and those that have not, we assessed a wide range of issues, including changes in medical and laboratory capacity, workload, psychological factors, and treatment strategies for COVID-19.

4.1. Part 1, status of surveyed medical facilities

As shown in Fig. 2C, the capacity of the facilities for ventilator and ECMO management remained almost the same across all

surveys. It is impossible to draw a definite conclusion because those who responded to the questionnaire differed from survey to survey, and comparisons could not be made between the same facilities. However, it is likely that the capacity of intensive care requiring ventilator and ECMO has not increased through this pandemic (the number of operable ECMO was not surveyed in Surveys 3–4 due to an error in questionnaire preparation). Although public opinion is calling for an increase in medical treatment capacity, a high level of expertise in the field of intensive care is required, especially for the treatment of severe cases. It is impossible to train medical staff with such skills overnight, and the issue should be discussed on the premise that the capacity for treating critically ill patients will not increase easily in the future. Increasing the number of medical experts trained in infectious disease and intensive care with a long-term perspective may be one solution. However, the need for such experts changes drastically depending on the disease prevalence, thereby complicating the problem. On the other hand, there was a clear improvement in the PCR testing system over time. Fig. 2B shows that more laboratories can now perform PCR tests at their facilities, and the number of tests available per day has increased. The ability to perform tests without delay is extremely important for the management of suspected cases. Although not evaluated in this survey, it is expected that many facilities have started to perform SARS-CoV-2 diagnostic tests other than PCR, such as loop-mediated isothermal amplification (LAMP) and antigen tests. It is believed that the overall testing system is improving.

4.2. Part 2, role of respiratory physicians in COVID-19 management

The workload of respiratory medicine has increased due to the COVID-19 pandemic. As evidence for infection control gradually became available, the degree of reduction in usual

workload gradually decreased compared with the early stages of the pandemic. However, the overall workload, including COVID-19 care, is thought to have increased. It is important to balance respiratory diseases other than COVID-19 treatments as the fight against the pandemic continues. The proportion of facilities where respiratory physicians were in charge of more than 76% of confirmed COVID-19 cases decreased in Survey 4 (Fig. 3A), and collaboration in each region gradually improved (Fig. 2D). These points suggest that the respiratory physicians' burden in the treatment of COVID-19 may be reduced if roles are divided. However, many facilities still suffer from serious work overload. Another major problem reported by about 20% of facilities is that there is still no cooperation with other hospital departments, and urgent improvement is required.

Work overload increases the likelihood of mental health problems [5]. In addition, physicians tend to avoid psychiatric support due to the stigma and negative influence on their careers [6]. Postponement of bronchoscopy and scheduled hospitalization were the most common restrictions on usual work, but they decreased significantly after Survey 2. The greater reduction in the usual operations in Survey 4 compared with Survey 3 was thought to be due to the increase in the number of COVID-19 patients (Fig. 1). Although the debate about the indications for bronchoscopy and the extent to which infection control measures should be implemented is still ongoing, based on the statements of various academic societies, it seems reasonable to postpone non-urgent, scheduled bronchoscopy in endemic areas [7]. The rate of postponement of chemotherapy was low at the time of Survey 1, but there was no clear improvement in subsequent surveys. Postponement of chemotherapy may directly affect the prognosis of patients; therefore, there is an urgent need to establish a system to facilitate referral to neighboring medical institutions when necessary [8].

4.3. Part 3, problems in clinical practice

Major problems in clinical practice include a lack of PPE, harassment, and stigma (Fig. 4). Surprisingly, about 30% of medical institutions were still stressed about PPE shortages in Survey 4. In some cases, due to their responsibility and commitment, healthcare workers may not be able to refuse medical treatment even if there is a shortage of PPE. Support from society is, therefore, essential as one-sided devotion of the healthcare workers alone will probably lead to failure [9,10]. The lack of PPE has already been shown to have a negative impact on the mental health of healthcare workers [5]. Therefore, it is hoped that more detailed data will be collected on where and what type of PPE is in short supply and that the supply is improved. There are two possible solutions to the PPE shortage problem. One is to support the PPE manufacturing supply chain more actively with the national budget. The other is to establish a system that can quickly estimate the specific types of PPE in short supply at each medical institution and distribute them more effectively. A total of six months have passed since Survey 4, and although there is no precise data, the availability of PPE seems to be improving nationwide. However, it is necessary to steadily promote these measures due to the possibility of further demand for PPE in the future.

There have been reports of harassment and stigma against healthcare workers and patients with COVID-19 from various parts of the world [2–4]. As expected, harassment and stigma remain a significant problem; only Survey 4 added the requirement of “within the last month” to the question, yet about 20% of the institutions experienced harassment or stigma. This situation did not change significantly from Survey 1. Surprisingly, discrimination occurred more often in the hospital (13.4%) than outside the hospital (11.3%) in Survey 4. This suggests that the problem of discrimination remains unresolved, even among healthcare professionals.

The survey results indicate the possibility of continued harassment and stigma in the future unless the current measures are changed. It is difficult to change society through measures taken by individuals or facilities alone. Work is needed to eradicate discrimination and prejudice among healthcare workers by taking political action.

4.4. Part 4, treatment of COVID-19

Since COVID-19 is an emerging infectious disease, the treatment has changed significantly with accumulated evidence. In particular, the RECOVERY trial of dexamethasone [11] and the ACTT-1 trial of remdesivir [12] demonstrated the efficacy of these drugs as therapeutic agents. These results were promptly reflected in the IDSA practice guidelines [13] and the Japanese COVID-19 practice guide [14], which changed the choice of therapeutic agents by Japanese respiratory physicians, as supported by the present survey. With regard to remdesivir, the World Health Organization did not recommend its use after the results of the Solidarity study [15], which may have resulted in the difference in its use compared with dexamethasone. The frequency of use of favipiravir [16], ciclesonide inhalation, and nafamostat may have decreased over time as they did not show the expected therapeutic effect in clinical trials. Due to the high level of public interest in COVID-19, strong demand for the early use of candidate drugs for treatment in the future is expected. However, until the results are obtained in quality-assured clinical trials, it is necessary to make careful decisions about their use.

In the future, many factors such as the emergence of virus strains with genetic mutations, the speed of vaccine dissemination, and the hosting of the Tokyo Olympics/Paralympics may affect the prevalence of COVID-19 in Japan. It is extremely difficult to make accurate predictions about the future, but it is unlikely that the problem will be solved in the short term. Although this survey was comprehensive, there may be a need for a more specialized survey focused on the mental health of respiratory physicians. Our survey had several limitations. First, the response rate to the questionnaire, especially for Survey 4 was low. The facilities with increased workload due to COVID-19 could have responded more actively. Conversely, due to the outbreak of COVID-19, they may have had difficulty finding time to respond. Furthermore, only one representative of each facility could answer the questionnaire. The representativeness of the data must, therefore, be interpreted with caution. Second, some facilities did not participate in all the surveys; therefore, it is important to note that the data do not show changes over time for the same facilities. Finally, more than 70% of the facilities

that responded to the survey had 301 or more beds, which may not reflect the situation of smaller hospitals.

5. Conclusion

Despite these limitations, our report is the first survey to identify the problems (increased workload, lack of PPE, harassment, and stigma) encountered by respiratory physicians in Japan regarding COVID-19 management. Our study also presents the COVID-19 influence trend in medical institutions during the first year of the pandemic in Japan. It may be useful in predicting the problems that may arise in the future when emerging infectious diseases follow SARS-CoV2.

Conflict of Interest

KF received honoraria from AstraZeneca, Boehringer-Ingelheim, Novartis, GlaxoSmithKline, and research funding from Boehringer-Ingelheim, Taiho Pharmaceutical, Chugai Pharmaceutical, Ono Pharmaceutical outside the submitted work. TK received research funding from Chugai Pharmaceutical outside the submitted work. KK, SK, YH, AY have no conflicts of interest.

Acknowledgments

KK contributed to the investigation, data curation, writing original draft. SK contributed to the planning, data gathering, and editing of the article. TK, KF, YH, and AY contributed to the supervision and editing of the article. All authors commented on draft versions and approved the final version.

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