Nationwide Survey of Japanese Cardiac Rehabilitation Training Facilities During the Coronavirus Disease 2019 Outbreak

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Background: Since the reporting of a cluster outbreak of coronavirus disease 2019 (COVID-19) in sports gyms, the Japanese Association of Cardiac Rehabilitation (CR) shared a common understanding of the importance of preventing patients and healthcare providers from contracting COVID-19. This questionnaire survey aimed to clarify the status of CR in Japan during the COVID-19 outbreak.

Methods and Results: An online questionnaire survey was conducted in 37 Japanese CR training facilities after the national declaration of a state of emergency in 7 prefectures. Among these facilities, 70% suspended group ambulatory CR and 43% suspended cardiopulmonary exercise testing (CPX). In contrast, all facilities maintained individual inpatient CR. Of the 37 facilities, 95% required CR staff to wear a surgical mask during CR. In contrast, 50% of facilities did not require patients to wear a surgical mask during CR. Cardiac telerehabilitation was only conducted by a limited number of facilities (8%), because this method was still under development. In our survey, 30% of the facilities not providing cardiac telerehabilitation had specific plans for its future use.

Conclusions: Our data demonstrate that ambulatory CR and CPX were suspended to avoid the spread of COVID-19. In the future, we need to consider CR resumption and develop new technologies for cardiovascular patients, including cardiac telerehabilitation.

Key Words: 3Cs; Ambulatory cardiac rehabilitation; Cardiac telerehabilitation
In this study, we used a questionnaire to determine what measures were taken in CR training facilities against the COVID-19 outbreak after the Japanese government’s declaration of a state of emergency.

**Methods**

An online questionnaire was created Google Form and emailed to 40 Japanese CR training facilities on April 13, 2020, after the declaration of a state of emergency in 7 major prefectures but before the nationwide declaration. The data obtained were compiled by the Public Relations Committee of the JACR. The questionnaire included basic information for each of the facilities, exercise therapy implementation, exercise testing, cardiac telerehabilitation, patient guidance, and other aspects affecting CR implementation and education. Based on the results of the questionnaire, we assessed differences among facilities (between those accepting patients with COVID-19 and those not) and regions (between those under a state of emergency and those not).

**Ethical Considerations**

The study protocol was approved by the St. Marianna University School of Medicine Institutional Committee on Human Resource, Kawasaki, Japan (No. 4863). The study was performed in accordance with the Declaration of Helsinki.
Table 1. Status of Cardiac Rehabilitation Facilities During the COVID-19 Outbreak

| Survey items                                      | Facility status                  | Facility regions |
|---------------------------------------------------|----------------------------------|------------------|
|                                                   | All (n=37)                       | Accepting COVID-19 patients (n=28) | Not accepting COVID-19 patients (n=9) | P value | In a state of emergency (n=19) | Not in a state of emergency (n=18) | P value |
| Continuing group ambulatory CR: Yes               | 11 (30)                          | 9 (32)           | 2 (22)          | 0.57    | 4 (21)                        | 7 (39)                          | 0.24    |
| Continuing group inpatient CR: Yes                | 19 (51)                          | 16 (57)          | 3 (33)          | 0.21    | 10 (53)                       | 9 (50)                          | 0.87    |
| Continuing individual inpatient CR: Yes           | 37 (100)                         | 28 (100)         | 9 (100)         | –       | 19 (100)                      | 18 (100)                        | –       |
| Cancellations of ambulatory CR from patients: Yes | 29 (78)                          | 22 (79)          | 7 (78)          | 0.96    | 16 (84)                       | 13 (72)                         | 0.38    |
| Requirement for CR staff to wear surgical masks   | 35 (95)                          | 27 (96)          | 8 (89)          | 0.38    | 18 (95)                       | 17 (94)                         | 0.97    |
| during CR: Yes                                    | Requirement for patients to wear surgical masks | 17 (46) | 12 (43) | 5 (56) | 0.51 | 8 (42) | 9 (50) | 0.63 |
| Disinfection before and after CR: Yes             | 33 (89)                          | 25 (89)          | 8 (89)          | 0.97    | 16 (84)                       | 17 (94)                         | 0.32    |
| Modified regular CR: Yes                          | 33 (89)                          | 25 (89)          | 8 (89)          | 0.97    | 17 (89)                       | 16 (89)                         | 0.95    |
| Continuing treadmill test: Yes                    | 24 (65)                          | 18 (64)          | 6 (67)          | 0.90    | 10 (53)                       | 14 (78)                         | 0.11    |
| Continuing CPX: Yes                               | 21 (57)                          | 15 (54)          | 6 (67)          | 0.49    | 8 (42)                        | 13 (72)                         | 0.06    |
| Modified regular CPX: Yes                         | 21 (57)                          | 17 (61)          | 4 (44)          | 0.39    | 11 (58)                       | 10 (56)                         | 0.89    |
| Conducting remote CR programs: Yes                | 3 (8)                            | 1 (4)            | 2 (22)          | 0.07    | 3 (16)                        | 0 (0)                           | 0.06    |
| Continuing patient education for inpatients: Yes  | 6 (16)                           | 6 (21)           | 0 (0)           | 0.13    | 4 (21)                        | 2 (11)                          | 0.41    |
| Changes in instructional content: Yes             | 17 (46)                          | 15 (54)          | 2 (22)          | 0.10    | 10 (53)                       | 7 (39)                          | 0.40    |

Unless indicated otherwise, data are presented as n (%). *Saitama, Chiba, Tokyo, Kanagawa, Osaka, Hyogo, and Fukuoka. CPX, cardiopulmonary exercise testing; CR, cardiac rehabilitation.

Statistical Analysis
Categorical data are expressed as numbers and percentages. Intergroup differences were evaluated using Fisher’s exact test for categorical variables. Statistical analyses were conducted using JMP® Pro 14.2.0.

Results
Of the 40 Japanese CR training facilities that received the questionnaire, 37 (92.5%) completed the survey: 13 facilities in the Kanto region, 7 each in the Kinki and Kyushu regions, 3 in the Tohoku region, 2 each in the Hokkaido and Chugoku regions, and 1 each in the Tokai, Hokuriku and Shikoku regions (Figure). Of the 37 facilities (22 university hospitals, 15 general hospitals), 28 (76%) accepted patients with COVID-19 and 10 (37%) encountered COVID-19 cases.

Of the 37 facilities, 70% suspended group ambulatory CR (Table 1). There were no significant differences in the suspension of group ambulatory CR between facilities that did and did not accept patients with COVID-19 (32% vs. 22%, respectively; P=0.57) or between regions under a state of emergency and those not (21% vs. 39%, respectively; P=0.24). The suspension of inpatient group CR was decided by individual facilities: 51% of facilities continued group CR and the remaining 49% suspended group CR. There were no significant differences in the suspension of inpatient group CR between facilities that did and did not accept patients with COVID-19 (57% and 33%, respectively; P=0.21) or between regions under a state of emergency and those not (53% and 50%, respectively; P=0.87). In contrast, all facilities maintained individual inpatient CR.

Of the 37 facilities, 95% required CR staff to wear a surgical mask during CR. In contrast, 50% of facilities did not require patients to wear a surgical mask during CR. No facilities status and regional differences were observed in 90% of the facilities disinfected the CR room before and after each CR session (89% and 89%, P=0.97; 84% and 94%, P=0.32, respectively).

Of the 37 facilities, 65% continued with treadmill testing, whereas approximately half the facilities in areas under a state of emergency decided to suspend it. CPX was suspended in 43% of facilities, including 58% of facilities in areas under a state of emergency (vs. 28% in areas not under a state of emergency), and this decision greatly varied according to region.

Cardiac telerehabilitation was only conducted by a limited number of facilities (8%), because this method was still under development. In our survey, 30% of the facilities not providing cardiac telerehabilitation had specific plans for its future use.

From the survey results, 84% of facilities suspended group inpatient education. Because alternate items were not included in the questionnaire, it was assumed that group inpatient education shifted to individualized instruction. The details remain unclear. With the spread of COVID-19, approximately half the surveyed CR facilities have made additional changes to their instructions and procedures.

Discussion
Many departments restricted their cardiological procedures, and this rate changed according to the pandemic situation. The exacerbation of cardiovascular disease resulting from the pandemic restrictions should not be ignored. The details remain unclear. With the spread of COVID-19, approximately half the surveyed CR facilities have made additional changes to their instructions and procedures.
patients with COVID-19. Of note, 80% of the facilities experienced ambulatory CR cancellations from patients. This suggests an improved awareness of patients, which was one of the main objectives in ambulatory CR.12,13
Notably, 89% of the facilities took various measures to avoid the 3Cs in both group and individual CR at the discretion of each facility (Table 2). These detailed measures should be promptly shared by all CR facilities.

When we perform CPX, we are at risk of infection exposure from the respiratory droplets of patients coughing, which can cause viral aerosolization. Approximately 60% of facilities decided to conduct inspections and established infection control measures. Decisions regarding stress exercise testing, including CPX, should be based on individualized risk assessment and a patient’s clinical status. Shared decision making between the patients and the CR team is an important component.13
Cardiac telerehabilitation was only conducted by a limited number of facilities at the time of the survey because this method was still under development. In our survey, 30% of facilities not providing cardiac telerehabilitation had specific future plans, suggesting the possibility of further development of cardiac telerehabilitation during the COVID-19 outbreak.14–16
For safe CR during the COVID-19 pandemic:
• to avoid crowds, group rehabilitation and instruction should be suspended
• to avoid excessive (patient) testing, CR staff should allow patients to walk about in a restricted area under certain conditions and instruct them as to how to perform aerobic exercises and muscle strength training at home
• to avoid further spread of COVID-19, the use of face masks and hand washing are compulsory.

The status of CR was assessed based on the results of the questionnaire. The data obtained demonstrated that ambulatory CR and CPX were suspended to avoid the spread of COVID-19. Thus, it is essential to identify measures that should be taken at appropriate times. At present, there is a need to establish new CR strategies for continuous prevention in cardiovascular patients, such as the development of new technologies providing appropriate and safe CR even during a pandemic.9,17 We believe that we will be able to provide appropriate and safe CR to medical professionals and patients even during the COVID-19 outbreak by using suitable guidelines and cardiac telerehabilitation.

Table 2. How to Avoid the 3Cs (Closed Spaces, Crowded Places, and Close-Contact Settings) in CR

| Closed spaces with poor ventilation          |
|---------------------------------------------|
| • Ensure regular ventilation of the rehabilitation room |
| • Consider the well-organized placement of patients |

| Crowded places with many people nearby       |
|---------------------------------------------|
| • Change group exercise therapy sessions to individualized instruction (1:1 sessions) |
| • Reduce the number of patients in each session as much as possible |
| • Provide CR to inpatients in hospital wards and not in rehabilitation rooms where other rehabilitation patients gather |

| Close-contact setting, such as close-range conversation |
|---------------------------------------------------------|
| • When using cycle ergometers and treadmills, keep a minimum distance of 2 m between patients |
| • Ensure all patients and CR staff wear surgical masks |
| • Avoid cough-inducing exercises |

CR, cardiac rehabilitation.

Conclusions
Our data demonstrated that ambulatory CR and CPX were suspended to avoid the spread of COVID-19. In the future, we need to consider CR resumption and develop new technologies for cardiovascular patients, including cardiac telerehabilitation.

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IRB Information
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References
1. Mizuno A, Matsumoto C, Yoneoka D, Kishi T, Ishida M, Sanada S, et al. Cardiology department practices in the first wave of the coronavirus disease pandemic: A nationwide survey in Japan by the Japanese Circulation Society. Circ Rep 2021; 3: 137–141.
2. Sugimoto T, Mizuno A, Kishi T, Ito N, Matsumoto C, Fukuda M, et al. Coronavirus disease 2019 (COVID-19) information for cardiologists: Systematic literature review and additional analysis. Circ J 2020; 84: 1039–1043.
3. Kishi T, Mizuno A, Ishida M, Matsumoto C, Fukuda M, Sanada S, et al. Recommendations for maintaining the cardiovascular care system under the conditions of the COVID-19 pandemic: 1st edition, April 2020. Circ J 2020; 84: 2023–2026.
4. Matsue Y, Kinugasa Y, Kitai T, Ohishi S, Yamamoto K, Tsutsui H. Effect of the COVID-19 pandemic on acute respiratory care of hypoxic patients with acute heart failure in Japan: A cross-sectional study. Circ Rep 2020; 2: 499–506.
5. Prime Minister’s Office of Japan, Ministry of Health, Labour and
Welfare. Important notice for preventing COVID-19 outbreaks. https://www.mhlw.go.jp/content/10900000/000619576.pdf (accessed July 20, 2020).

6. Kamiya K, Yamamoto T, Tsuchihashi-Makaya M, Ikegame T, Takahashi T, Sato Y, et al. Nationwide survey of multidisciplinary care and cardiac rehabilitation for patients with heart failure in Japan: An analysis of the AMED-CHF Study. Circ J 2019; 83: 1546–1552.

7. Origuchi H, Itoh H, Momomura SI, Nohara R, Daida H, Masuda T, et al. Active participation in outpatient cardiac rehabilitation is associated with better prognosis after coronary artery bypass graft surgery: J-REHAB CABG Study. Circ J 2020; 84: 427–435.

8. Goto Y, Suito M, Iwasaka T, Daida H, Koizumi M, Ueshima K, et al. Poor implementation of cardiac rehabilitation despite broad dissemination of coronary interventions for acute myocardial infarction in Japan: A nationwide survey. Circ J 2007; 71: 173–179.

9. Nakayama A, Takayama N, Kobayashi M, Hyodo K, Maeshima N, Takayuki F, et al. Remote cardiac rehabilitation is a good alternative of outpatient cardiac rehabilitation in the COVID-19 era. Environ Health Prev Med 2020; 25: 48.

10. Mizuno A, Matsumoto C, Kishi T, Ishida M, Sanada S, Fukuda M, et al. Cardiology department policy in Japan after coronavirus disease-2019 (COVID-19): Descriptive summary of 2nd nationwide survey by the Japanese Circulation Society. Circ Rep 2021; 3: 100–104.

11. The Japanese Association of Cardiac Rehabilitation. Cardiac rehabilitation guidance under coronavirus disease 2019 outbreak [in Japanese]. http://www.jacr.jp/web/wp-content/uploads/2020/04/JACR_CV19_20200511.pdf (accessed July 20, 2020)

12. Izawa H, Yoshida T, Ikegame T, Izawa KP, Ito Y, Okamura H, et al. Standard cardiac rehabilitation program for heart failure. Circ J 2019; 83: 2394–2398.

13. Tsutsui H, Isobe M, Ito H, Ito H, Okumura K, Ono M, et al; on behalf of the Japanese Circulation Society and the Japanese Heart Failure Society Joint Working Group. JCS 2017/JHFS 2017 guideline on diagnosis and treatment of acute and chronic heart failure: Digest version. Circ J 2019; 83: 2084–2184.

14. American College of Cardiology. General guidance on deferring non-urgent CV testing and procedures during the COVID-19 pandemic. 2020. https://www.acc.org/latest-in-cardiology/articles/2020/03/24/09/42/general-guidance-on-deferring-non-urgent-cv-testing-and-procedures-during-the-covid-19-pandemic (accessed July 20, 2020).

15. Yeo TJ, Wang YL, Low TT. Have a heart during the COVID-19 crisis: Making the case for cardiac rehabilitation in the face of an ongoing pandemic. Eur J Prev Cardiol 2020; 27: 903–905.

16. Thomas E, Gallagher R, Grace SL. Future-proofing cardiac rehabilitation: Transitioning services to telehealth during COVID-19. Eur J Prev Cardiol, doi:10.1177/2047487320922926.

17. Babu AS, Arena R, Ozemek C, Lavie CJ. COVID-19: A time for alternate models in cardiac rehabilitation to take centre stage. Can J Cardiol 2020; 36: 792–794.

Supplementary Files
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