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Original article

Knowledge, perception, and level of confidence regarding COVID-19 care among healthcare workers involved in cardiovascular medicine: a web-based cross-sectional survey in Japan



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ABSTRACT

Background: The pandemic of coronavirus disease 2019 (COVID-19) has a significant impact on daily practice in cardiovascular medicine. The preparedness of healthcare workers (HCWs) can affect the spread of infection and the maintenance of the healthcare system. This study aimed to investigate the knowledge, perception, and level of confidence regarding COVID-19 care among HCWs involved in cardiovascular medicine.

Methods: A cross-sectional, web-based study about COVID-19 was performed between April 22 and May 7, 2020, among 311 HCWs in cardiovascular departments. The demographic information, COVID-19-related knowledge, and perception and level of confidence toward COVID-19 care were assessed.

Results: The median age of the participants was 38 years, and 215 (69.8%) were male. There were 134 (43.1%) physicians and 177 (56.9%) non-physician HCWs. The HCWs, especially non-physician HCWs, had insufficient knowledge about infection-prevention measures for COVID-19, such as how to isolate patients with COVID-19, how to use personal protective equipment, and how to prevent infection during aerosol-generating procedures. Most HCWs showed a low level of confidence toward COVID-19 care, and such poor confidence was associated with the lack of knowledge on optimal infection-prevention measures.

Conclusions: This survey revealed the lack of knowledge about adequate infection-prevention measures for COVID-19. More attention should be paid to the preparedness of HCWs, and educating and supporting HCWs involved in cardiovascular medicine is an urgent need.

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Introduction

Coronavirus disease 2019 (COVID-19), which originated from Wuhan, China, in December 2019, has been spreading worldwide [1,2]. The World Health Organization (WHO) declared COVID-19 a pandemic on March 11, 2020. In Japan, the first confirmed COVID-19 case was reported on January 16, 2020 [3]. The Japanese government proclaimed a state of emergency for Tokyo and the

prefectures of Chiba, Saitama, Kanagawa, Osaka, Hyogo, and Fukuoka on April 7, and the declaration was extended nationwide on April 16, 2020. A total of 11,919 cases and 287 deaths have been confirmed in Japan as of April 23, 2020 [4]. Exhaustion of healthcare resources, including medical personnel, medical equipment, and personal protective equipment (PPE), is occurring in many regions while dealing with patients with COVID-19.

Recent studies showed that cardiovascular comorbidities are common in patients with COVID-19 and such patients are at a higher risk of morbidity and mortality [5,6]. In addition, various cardiac manifestations, such as myocarditis, venous thrombosis, arrhythmia, and heart failure were reported in patients with

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COVID-19 [7]. Therefore, the importance of cardiovascular care in dealing with the COVID-19 pandemic has become pronounced. To ensure and maintain the efficiency of the cardiovascular healthcare system, it is essential to take appropriate infection-prevention measures among healthcare workers (HCWs) and to protect both HCWs and patients from infection. However, the preparedness for COVID-19 pandemic among HCWs involved in the cardiovascular healthcare system has been poorly investigated. Accordingly, the aim of this study was to evaluate the knowledge, perception, and level of confidence toward COVID-19 care among HCWs involved in cardiovascular medicine.

Methods

Study design and participants

This was a cross-sectional study conducted through a web-based survey between April 22 and May 7, 2020. The participants were recruited from the cardiovascular departments of 35 hospitals, including three university hospitals. All hospitals had multiple departments, including cardiovascular department, and were general hospitals that played a central role in the healthcare system of each region. Most of the hospitals were located in the Kansai region, the southern-central region of Japan's main island Honshu. A member of the research team of each hospital explained the survey purpose and recruited the participants. At the time of the survey, sporadic clusters were occurring in hospitals and nursing homes across Japan, leading to the collapse of healthcare systems in some areas [8].

The study complied with the Declaration of Helsinki and was approved by the ethics committee of the Kyoto Prefectural University of Medicine (reference number: ERB-C-1718). Electronic informed consent was obtained from each participant prior to starting the investigation. Participants could withdraw from the survey at any moment without providing any justification. All authors read and agreed to the article as written.

Data collection

An online questionnaire using Google Forms was used to collect the data to prevent the spread of COVID-19 by human contact. The survey was conducted using a multiple-choice questionnaire comprising 41 questions divided into the following sections: HCWs' demographic characteristics; HCWs' knowledge regarding COVID-19 (i.e. symptoms and diagnostic tools, aspects that should be considered to identify high-risk patients for COVID-19, and sources of knowledge about COVID-19); HCWs' perception and level of confidence toward COVID-19 care; HCWs' satisfaction level regarding the supply of medical equipment for COVID-19 care; and HCWs' feeling of anxiety and stress. This survey did not include open-ended questions. Questions on infection-prevention measures for COVID-19 were answered on a Yes/No scale. The participants were also asked to report their experience of caring for patients with COVID-19 and relevant training programs they had received.

Statistical analysis

Descriptive analysis was used to describe items included in the survey. Continuous variables were presented as medians and interquartile ranges (quartiles 1–3) and categorical variables as counts and percentages. Differences in each item regarding the knowledge, perception, and level of confidence regarding COVID-19 care between physician and non-physician HCWs were analyzed using the Wilcoxon signed-rank test considering parity. We conducted a multiple regression analysis to identify the

independent determinants of the low level of confidence toward COVID-19 care (i.e. answering "Not at all confident" or "Slightly confident" in the survey). The following variables were included as possible confounders: age, gender (male), profession (physician), experience caring for patients with suspected or confirmed COVID-19 infection, experience of COVID-19 training program, knowledge about how to use PPE, knowledge about how to isolate patients with suspected or confirmed COVID-19 infection, knowledge about how to prevent infection when performing aerosol-generating procedures on patients with COVID-19, and knowledge about guidelines or online resources from major cardiovascular societies. Among variables with *p*-values <0.3 in the univariate analysis of each model, clinically relevant variables with lower *p*-values were treated as confounders, considering the number of endpoints and multicollinearity. Statistical analyses were performed using Microsoft R Open software (version 3.3.2; R Development Core Team, Vienna, Austria). The significance level for statistical hypothesis testing was set at 0.05 and the alternative hypothesis was two-sided.

Results

The participants' demographic characteristics are shown in Table 1. A total of 311 HCWs completed the survey (100% response rate). The median age of the participants was 38 years, and 215 (69.8%) were male. There were 134 (43.1%) physicians and 177 (56.9%) non-physician HCWs, consisting of 73 (23.5%) nurses, 36 (11.6%) clinical engineers, 56 (18.0%) radiology technologists, and 12 (3.9%) other HCWs. The majority of participants (60.5%) had over 10 years of work experience. Twenty-seven participants (9.8%) reported having experience caring for patients with suspected or confirmed COVID-19 infection, and 24 (7.8%) had completed a COVID-19 training program. There were no missing data regarding variables that were related to knowledge, perception, and level of confidence toward COVID-19 care.

Table 1
Demographic characteristics of study participants.

Parameters	Missing	Total (n = 311)
Age, years	10	38 (30–46)
<25 years, n (%)		16 (5.3)
25–34 years, n (%)		103 (34.2)
35–44 years, n (%)		95 (30.5)
45–55 years, n (%)		67 (22.2)
>55 years, n (%)		20 (6.6)
Gender	3	
Male, n (%)		215 (69.8)
Female, n (%)		93 (30.2)
Job category, n (%)	0	
Physicians, n (%)		134 (43.1)
Nurses, n (%)		73 (23.5)
Clinical engineers, n (%)		36 (11.6)
Radiology technologists, n (%)		56 (18.0)
Other, n (%)		12 (3.9)
Work experience, years	5	13 (7–21)
<5 years, n (%)		49 (16.0)
5–10 years, n (%)		72 (23.5)
>10 years, n (%)		185 (60.5)
Organization	0	
University hospital, n (%)		74 (23.8)
Public hospital, n (%)		148 (47.6)
Private hospital, n (%)		89 (28.6)
Experience caring for patients with suspected or confirmed COVID-19 infection, n (%)	36	27 (9.8)
Experience of COVID-19 training program, n (%)	4	24 (7.8)

Categorical and continuous variables are presented as number (percentage) and as median (25–75th percentile), respectively.
COVID-19, Coronavirus disease 2019.

Table 2
Knowledge about COVID-19.

Items	Total (n = 311)	Physician (n = 134)	Non-physician (n = 177)	p-value
Symptoms of COVID-19 (multiple-choice question)				
Fever	305 (98.1)	133 (99.3)	172 (97.2)	0.241
Cough	299 (96.1)	133 (99.3)	166 (93.8)	0.013
Sore throat	231 (74.3)	114 (85.1)	117 (66.1)	< 0.001
Runny nose	202 (65.0)	107 (79.9)	95 (53.7)	< 0.001
Vomiting	162 (52.1)	99 (73.9)	63 (35.6)	< 0.001
Diarrhea	182 (58.5)	105 (78.4)	77 (43.5)	< 0.001
Shortness of breath	238 (76.5)	123 (91.8)	115 (65.0)	< 0.001
Red eyes	129 (41.5)	89 (66.4)	40 (22.6)	< 0.001
Skin rash	86 (27.7)	63 (47.0)	23 (13.0)	< 0.001
Taste disorder	301 (96.8)	132 (98.5)	169 (95.5)	0.197
Smell disorder	291 (93.6)	129 (96.3)	162 (91.5)	0.091
Joint or muscle pain	158 (50.8)	90 (67.2)	68 (38.4)	< 0.001
May present with no symptoms	277 (89.1)	120 (89.6)	157 (88.7)	0.812
Diagnostic measures for COVID-19 (multiple-choice question)				
PCR test on respiratory samples	269 (86.5)	118 (88.1)	151 (85.3)	0.482
Antibody testing using blood samples	72 (23.2)	23 (17.2)	49 (27.7)	0.029
Chest radiographic examination	167 (53.7)	77 (57.5)	90 (50.8)	0.247
Chest computed tomographic examination	240 (77.2)	103 (76.9)	137 (77.4)	0.911
Aspects that should be considered to identify patients with COVID-19 (multiple-choice question)				
Presence of symptoms of a respiratory infection	296 (96.1)	131 (97.8)	165 (94.8)	0.187
History of travel to areas experiencing transmission of COVID-19	296 (96.1)	128 (95.5)	168 (96.6)	0.644
History of contact with possible infected patients	299 (97.1)	132 (98.5)	167 (96.0)	0.308
History of unexplained fever lasting more than four days	291 (94.5)	127 (94.8)	164 (94.3)	0.842
Sources of knowledge about COVID-19 (multiple-choice question)				
News media (e.g. newspaper, television, radio)	277 (89.6)	117 (87.3)	160 (91.4)	0.239
Web/Internet	263 (84.8)	125 (93.3)	138 (78.4)	< 0.001
Social networking service (e.g. Twitter, Facebook)	106 (34.2)	49 (36.6)	57 (32.4)	0.442
Friends/Colleagues/Family members	175 (56.5)	83 (61.9)	92 (52.3)	0.089
Scientific journals	109 (35.3)	77 (57.5)	32 (18.2)	< 0.001
Government announcement	132 (42.6)	52 (38.8)	80 (45.5)	0.241
Infection-prevention measures for COVID-19 (yes/no question)				
Knowledge about how to use PPE	194 (63.4)	94 (70.1)	100 (56.5)	0.014
Knowledge about how to isolate patients with suspected or confirmed COVID-19 infection	93 (29.9)	45 (33.6)	48 (27.1)	0.218
Knowledge about how to prevent infection when performing aerosol-generating procedures on patients with COVID-19	129 (41.5)	79 (59.0)	50 (28.2)	< 0.001
Knowledge about what to do if I have signs and symptoms of COVID-19	292 (93.9)	128 (95.5)	164 (92.7)	0.296
Knowledge about whom to report to if I come into contact with patients with suspected or confirmed COVID-19 infection	268 (86.2)	111 (82.8)	157 (88.7)	0.138
Knowledge about guidelines or online resources of COVID-19 from major cardiovascular societies	152 (49.0)	116 (86.6)	36 (20.5)	< 0.001

Categorical variables are presented as number (percentage).

COVID-19, coronavirus disease 2019; PCR, polymerase chain reaction; PPE, personal protective equipment.

There were no missing data regarding variables that were related to knowledge about COVID-19.

Knowledge about COVID-19

The knowledge about COVID-19 among the participants is summarized in Table 2. Most HCWs reported fever, cough, and taste and smell disorders as symptoms of COVID-19, while only a few HCWs recognized skin and eye manifestations. There were some knowledge gaps between physicians and non-physician HCWs regarding the relatively uncommon symptoms of COVID-19, such as vomiting, diarrhea, red eyes, skin rash, and joint or muscle pain. Regarding the diagnostic examination for COVID-19, most HCWs correctly recognized the polymerase chain reaction testing on respiratory samples as the mainstay of diagnosis, whereas the computed tomographic examination was also considered a diagnostic tool for COVID-19. Almost all HCWs knew the aspects that should be considered to identify patients at risk of having COVID-19. With respect to the sources of knowledge, approximately 90% of the participants reported using conventional news media (e.g. newspapers, television, and radio), and 106 participants (34.2%) used social networking services, such as Twitter and Facebook. Physicians were more likely to obtain information via scientific journals and the internet as sources of information compared to non-physician HCWs. Overall, there was a lack of knowledge about the infection-prevention measures for COVID-19, such as how to isolate patients with COVID-19, how to use PPE, and

how to prevent infection during aerosol-generating procedures. This trend was more evident among non-physician HCWs than physicians. Nearly half of the HCWs were aware of the guidelines or online resources of COVID-19 published by cardiovascular societies; however, most of them were physicians, and awareness among non-physician HCWs was low. The knowledge about how to use PPE and how to prevent infection during aerosol-generating procedures was significantly lower among non-physician HCWs than physicians.

Perception and level of confidence regarding COVID-19 care

The perception and level of confidence regarding COVID-19 care are shown in Table 3. Only 13.8% of HCWs responded that they kept themselves up to date with the information on COVID-19. Approximately 60% of the HCWs stated “No” when asked “Do you think you have received enough training for COVID-19 care?” The majority of HCWs were not satisfied with the supply of PPE for COVID-19 care. Notably, only two HCWs answered “confident” and 50 HCWs answered “somewhat confident” when asked about the confidence toward COVID-19 care. Most of the HCWs had a low level of confidence and answered “slightly confident” or “Not at all confident” (54.7% and 28.6%, respectively). Moreover, non-physician HCWs tended to have significantly lower levels of confidence

Table 3
Perception and level of confidence regarding COVID-19 care.

Questions	Total (n = 311)	Physician (n = 134)	Non-physician (n = 177)	p-value
Do you think you keep yourself up to date with the information on COVID-19?				0.249
Yes	43 (13.8)	22 (16.4)	21 (11.9)	
No	268 (86.2)	112 (83.6)	156 (88.1)	
Do you think you have received enough training for COVID-19 care?				0.748
Yes	34 (11.0)	13 (9.7)	21 (12.0)	
No	185 (59.9)	83 (61.9)	102 (58.3)	
I don't know	90 (29.1)	38 (28.4)	52 (29.7)	
Are you satisfied with the supply of PPE for COVID-19 care?				0.537
Very satisfied	3 (1.0)	2 (1.5)	1 (0.6)	
Satisfied	25 (8.1)	14 (10.4)	11 (6.3)	
Somewhat satisfied	69 (22.3)	29 (21.6)	40 (22.9)	
Slightly satisfied	134 (43.4)	59 (44.0)	75 (42.9)	
Not at all satisfied	78 (25.2)	30 (22.4)	48 (27.4)	
Are you anxious or stressed for COVID-19 care?				0.121
Very anxious or stressed	174 (56.5)	82 (61.7)	94 (53.1)	
Anxious or stressed	98 (31.8)	42 (31.6)	56 (31.6)	
Somewhat anxious or stressed	22 (7.1)	5 (3.8)	17 (9.6)	
Slightly anxious or stressed	14 (4.6)	4 (3.0)	10 (5.6)	
Not at all anxious or stressed	0 (0.0)	0 (0.0)	0 (0.0)	
Are you confident toward COVID-19 care?				< 0.001
Very confident	0 (0.0)	0 (0.0)	0 (0.0)	
Confident	2 (0.6)	1 (0.7)	1 (0.6)	
Somewhat confident	50 (16.1)	25 (18.7)	25 (14.1)	
Slightly confident	170 (54.7)	85 (63.4)	85 (48.0)	
Not at all confident	89 (28.6)	23 (17.2)	66 (37.3)	

Categorical variables are presented as number (percentage).
COVID-19, coronavirus disease 2019; PPE, personal protective equipment.
There were no missing data regarding variables that were related to perception and level of confidence toward COVID-19 care.

compared to physicians. The multivariate logistic regression analysis revealed that the low level of confidence was associated with the lack of knowledge about appropriate infection-prevention measures, such as how to use PPE, how to prevent infection during aerosol-generating procedures, and how to isolate patients with suspected or confirmed COVID-19 infection (Table 4).

Discussion

In this study, we investigated the knowledge, perception, and level of confidence regarding COVID-19 care among HCWs

involved in cardiovascular medicine. There was a lack of knowledge about optimal infection-prevention measures for COVID-19, such as how to use PPE, how to isolate patients with COVID-19, and how to prevent infection during aerosol-generating procedures. Most of the HCWs, especially non-physician HCWs, showed a low level of confidence toward COVID-19 care. Poor confidence was associated with the lack of knowledge about infection-prevention measures. Because this is the first survey to evaluate HCWs' preparedness for COVID-19 care in Japan, our study provides physicians with new insights into the field.

Table 4
Relevant factors of low level of confidence (i.e. answering "Not at all confident" or "Slightly confident" to the question "Are you confident toward COVID-19 care?" in the survey).

	Univariate		Multivariate	
	HR (95% CI)	p-value	Adjusted HR (95% CI)	p-value
Age	-0.024 (-0.053 to -0.005)	0.110	-0.0003 (-0.037 to -0.036)	0.988
Gender (Male)	-0.818 (-1.642 to -0.094)	0.036	-0.829 (-1.933 to 0.184)	0.121
Profession (Physician)	-0.335 (-0.935 to 0.264)	0.271	0.626 (-0.407 to 1.695)	0.241
Experience caring for patients with suspected or confirmed COVID-19 infection	-0.845 (-1.712 to 0.100)	0.065	-0.626 (-1.810 to 0.619)	0.307
Experience of COVID-19 training program	-0.553 (-1.482 to 0.504)	0.267	0.087 (-0.145 to 1.425)	0.893
Knowledge about how to use PPE	-2.994 (-4.818 to -1.795)	< 0.001	-2.047 (-3.952 to -0.696)	0.010
Knowledge about how to isolate patients with suspected or confirmed COVID-19 infection	-2.191 (-2.886 to -1.540)	< 0.001	-1.465 (-2.237 to -0.729)	< 0.001
Knowledge about how to prevent infection when performing aerosol-generating procedures on patients with COVID-19	-1.612 (-2.305 to -0.969)	< 0.001	-1.079 (-1.986 to -0.224)	0.016
Knowledge about guidelines or online resources of COVID-19 from major cardiovascular societies	-0.976 (-1.639 to -0.351)	0.003	-0.527 (-1.579 to 0.494)	0.315

In the multivariate model, the adjusted HR for low level of confidence (i.e. answering "Not at all confident" or "Slightly confident") compared with that for high level of confidence (i.e. answering "Very confident," "Confident," or "Somewhat confident") was calculated by adjusting for age, gender (male), profession (physician), experience caring for patients with suspected or confirmed COVID-19 infection, experience of COVID-19 training program, knowledge about how to use PPE, knowledge about how to isolate patients with suspected or confirmed COVID-19 infection, knowledge about how to prevent infection when performing aerosol-generating procedures on patients with COVID-19, and knowledge about guidelines or online resources from major cardiovascular societies.

CI, confidence interval; COVID-19, coronavirus disease 2019; HR, hazard ratio; PPE, personal protective equipment.

Lack of knowledge about infection-prevention measures for COVID-19

We demonstrated the lack of knowledge about appropriate infection-prevention measures for COVID-19, such as how to use PPE, how to isolate patients with COVID-19, and how to prevent infection during aerosol-generating procedures.

Wu et al. reported that a total of 1716 (3.8%) of 44,672 patients with COVID-19 were HCWs, indicating that HCWs are at an increased risk for COVID-19 transmission [9]. Wang et al. showed that among 138 confirmed patients with COVID-19, 41.3% were considered to have acquired infection from the hospital, and more than 70% of these were HCWs [10]. In Japan, cluster infections in hospitals have become a problem, and there are fears that this could lead to the collapse of the healthcare system. Therefore, the need for minimizing the risk of COVID-19 transmission to HCWs is becoming increasingly pronounced. To protect HCWs and patients from infection, the recommendations from the Japanese Circulation Society emphasize the importance of standard precautions while using PPE and optimal prevention when performing aerosol-generating procedures [11]. However, HCWs, especially non-physician HCWs, in this survey lacked such essential knowledge. Our results suggest that further efforts are needed toward educating and supporting HCWs in the areas of optimal use of PPE and adequate management of aerosol-generating procedures.

Low level of confidence toward COVID-19 care

Most HCWs, especially non-physician HCWs, showed a low level of confidence toward COVID-19 care. Poor confidence was associated with the lack of knowledge about infection-prevention measures.

In this study, only 7.8% of all the HCWs had finished a COVID-19 training program. Only a few HCWs felt that they had received enough training for COVID-19 care. In a survey of Chinese psychiatric hospitals, 65% of the HCWs reported having finished a COVID-19 training program [12]. Considering that our survey was conducted after COVID-19 infection was already widespread in Japan, the percentage of HCWs who received COVID-19 training was thought to be very low. We speculate that the absence of practical and effective training programs for HCWs has led to a lack of knowledge of basic infection-prevention measures and to the low level of confidence toward COVID-19 care. Previous studies suggested that training by hospitals and related organizations played an important role in the prevention of infectious diseases [13,14]. Our study revealed the clear need for training programs to improve the understanding of prevention strategies among HCWs. Such programs could improve the confidence of HCWs in providing appropriate care to patients with COVID-19 and protecting themselves as well. Employers in healthcare facilities have the responsibility of providing instructions and training on COVID-19 care to HCWs. In addition, individual HCWs also have the responsibility of keeping themselves up to date on current guidelines on COVID-19 and participating in provided training sessions. Based on the results of this study, there is a concern that non-physician HCWs are not well informed about current guidelines of COVID-19. Guidelines should be delivered to all HCWs, including non-physician HCWs, to make them aware of the best practices for COVID-19 care and optimal infection-prevention strategies.

Clinical implications and future perspectives

At the time of this survey, cluster outbreaks in hospitals and the spread of infection among HCWs had become a major problem in Japan. Further expansion of this situation would result in the disruption of the healthcare system and have a negative impact on

not only COVID-19 care but also cardiovascular emergency care, including primary percutaneous coronary intervention for patients with acute myocardial infarction. Hence, strengthening the training for HCWs on optimal preventive and protective measures for infection is an urgent need to maintain the efficiency of cardiovascular care during the COVID-19 pandemic. We hope our data will contribute to revealing problems associated with infection-prevention and control measures during COVID-19 care and protecting HCWs from infection to maintain healthcare systems. We believe that we have a social responsibility of achieving these goals.

Limitations

Despite its strengths, this study has some limitations. First, because participants were recruited from institutions in a specific area, the results may have been affected by selection bias. Second, as this is a cross-sectional study, evaluating causal relationships is impossible. Third, because the results of this study are based on a self-reported survey, they might not represent actual practices. Finally, this study included only Japanese participants, and the results cannot be generalized to other populations with different ethnic and geographical backgrounds. Therefore, further research is needed for confirmation and generalizability of the present findings.

Conclusions

In conclusion, our findings revealed the low level of confidence regarding COVID-19 care among HCWs in cardiovascular medicine. This poor confidence was associated with the lack of latest information regarding COVID-19 and the absence of knowledge on how to protect themselves and their patients. More attention should be paid to the preparedness of HCWs, and increased effort is urgently needed to educate and support HCWs involved in cardiovascular medicine.

Collaborators in the research

Yoshifumi Nakahara, MD, PhD; Koji Shiga, MD, PhD; Ryoji Kitamura, MD, PhD; Yasufumi Kunieda, MD, PhD; Atsuo Adachi, MD, PhD; Yasumasa Seo, MD, PhD; Masahiro Koide, MD, PhD; Naoki Maruyama, MD, PhD; Takashi Okada, MD, PhD; Jun Shiraishi, MD, PhD; Daisuke Irie, MD, PhD; Yoshinori Tsubakimoto, MD, PhD; Daisuke Naito, MD, PhD; Taku Kato, MD, PhD; Tetsuya Nomura, MD, PhD; Kenji Yanishi, MD, PhD; Takanori Kawasaki, MD, PhD; Kiichiro Tomiyasu, MD, PhD; Takayoshi Sawanishi, MD, PhD; Kazuya Ishibashi, MD, PhD; Shinya Nishizawa, MD, PhD; Sei Tsunoda, MD, PhD; Daisuke Kanbayashi, MD, PhD; Yoshiaki Harada, MD, PhD; Kiyonari Matsuo, MD, PhD; Kazunori Oono, MD, PhD; Hirokazu Yokoi, MD, PhD; Shinichiro Yamaguchi, MD, PhD; Kuniyoshi Fukai, MD, PhD; Masaki Kimata, MD, PhD; Hiroyuki Kurata, MD, PhD; Maki Katamura, MD, PhD; Kotaro Miyagawa, MD, PhD; Tatsuya Kawasaki, MD, PhD; Masaki Tsukamoto, Norimasa Taniguchi, MD, PhD; Tetsuya Tanaka, MD, PhD; Naohisa Sawada, MD, PhD; Noriyuki Kinoshita, MD, PhD; Natsuya Keira, MD, PhD; Hiroshi Fujita, MD, PhD.

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