SPECIAL ARTICLE

Healthcare use and RT-PCR testing during the first wave of the COVID-19 pandemic in Japan

Masaru Kurihara MD[1] | Kazuhiro Kamata MD[2] | Shun Nakahara MD[1] |
Kyoko Kitazawa MPH[3] | Shunzo Koizumi MD[4] | Yasuharu Tokuda MD, MPH[5]

[1]Department of Hospital Medicine, Urasoe General Hospital, Okinawa, Japan

[2]Department of General Internal Medicine, Aizu Medical Center, Fukushima Medical University, Fukushima, Japan

[3]Kyoto Pharmaceutical University, Kyoto, Japan

[4]Shichijo Clinic, Kyoto, Japan

[5]Muribushi Okinawa Center for Teaching Hospitals, Okinawa, Japan

Correspondence
Yasuharu Tokuda MD, MPH, Muribushi Okinawa Center for Teaching Hospitals, 3-42-8-901 Iso, Urasoe City, Okinawa, Japan.
Email: yasuharu.tokuda@gmail.com

Abstract

Background: Rapid testing, tracing, and isolation among symptomatic patients are the standard for controlling the COVID-19. However, during spring 2020, Japan employed a RT-PCR test policy by using a guideline, which was used for the public to visit hospitals or clinics when they had mild symptoms for 4 days or longer ("4-day rule") among low-risk patients. It is unknown of patients' experience of healthcare use and testing during the period under the guideline. Thus, we investigated the healthcare visiting and testing among patients who developed cold-like symptoms during the period.

Methods: Our survey was conducted online in September 2020 to a nationally representative sample of adults throughout Japan. We investigated the public's understanding of the guideline. In addition, we asked their experience with healthcare use and testing if they had noticed new-onset cold-like symptoms.

Results: Of 2,137 people surveyed, 1,698 (79.5%) recognized the guidelines, but 422 people (19.7%) misunderstood. There were 144 (6.7% of 2,137 people) who developed cold-like symptoms, and many of them experienced difficulties in getting through telephone calls to a public health center, and 25 (17% of 144 people) visited healthcare institutions. Of these 25 symptomatic patients, 15 (60%) could not receive testing because of decisions by physicians (14 patients) or a local public health center (1 patient).

Conclusion: There was a low use of healthcare and testing among symptomatic patients during the first wave of the pandemic in Japan. Testing capacity should be increased to provide effective care for patients with suspected COVID-19 in Japan.

KEYWORDS
COVID-19, guideline, healthcare use, novel coronavirus, RT-PCR test

1 | INTRODUCTION

The pandemic of coronavirus disease-2019 (COVID-19), which is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has presented a formidable threat to our society.[1] Since the emergence of COVID-19 in Wuhan, China, in December 2019, the infection has spread around the world with the official declaration of a Public Health Emergency of International Concern by the World Health Organization.[2] Many countries have tried to overcome huge difficulties by taking measures such as lockdowns, quarantines, as well as extensive testing, tracing, and isolation.[3]

Since the initial case was reported on 15th January, Japan faced the first wave of COVID-19 from March to May 2020.[4] During the first wave, Ministry of Health, Labour and Welfare (MHLW)

have promptly announced "guideline" for the public on 17th February.[5] Table 1 shows the contents of the guideline.[5] If patients would visit hospitals or clinics and they might be indicated for coronavirus reverse transcription-polymerase chain reaction (RT-PCR) test based on the decision by physicians, physicians needed to call local public health centers if their patients could undergo coronavirus RT-PCR test.

Because of the guideline, anecdotal reports indicated that there were many patients with upper respiratory symptoms who could not visit healthcare institutions and could not receive RT-PCR test.[6] The government of Japan declared a state of emergency on 7th April, and MHLW has revised the guideline on 8th May. However, over the pandemic period, the number of testing per unit population has not grown enough compared to that of other developed countries despite the high positivity in Japan.[7,8] As community transmissions have grown in winter 2020–2021 throughout Japan, Japan has recorded the highest weekly number of patients in western pacific countries with highest number of deaths among these countries.[5] Despite this fact, the number of viral testing conducted in healthcare institutions is still low,[7,8] which may reflect legacy effects from the previous guideline.

Lessons learned from any governmental policies and responses and experience among the public and healthcare institutions are invaluable for the future pandemic management.[9] However, there has been no formal investigation about patients' experience and journey of healthcare use and testing during the period under the guideline.[10] Therefore, we conducted a Web-based questionnaire survey to investigate public understanding of the guideline and experience with healthcare use and testing during the period of the first wave of COVID-19.

2 | METHODS

2.1 | Study design

A Web-based questionnaire was developed and used to collect responses anonymously on September 10, 2020. When participants first visited the website for the survey, the policy for using the collected data and protection of personal information was displayed. Only those who agreed with the informed consent policy could

TABLE 1 Guideline of the central government of Japan and societies of infectious diseases for the public, local public health centers, and healthcare institutions (4-day rule)

Timing for patients' healthcare use and RT-PCR testing
1. Cold-like symptoms or fever of 37.5°C or over for four days or longer
2. Two days of the similar symptoms for the elderly or persons with risk factors[a]
3. Severe fatigue or dyspnea

[a]Risk factors include hypertension, diabetes, chronic obstructive pulmonary disease, chronic renal failure on hemodialysis, immunocompromised diseases, or on immune suppressants.

participate in the questionnaire. This study was approved by the Ethics Committee.

2.2 | Study participants

Our nationwide cross-sectional survey was designed and conducted online in September 2020 using a nationally representative sample of adults. From a nationwide public panel of 7.6 million people registered with the INTAGE Corporation, a research company, the survey participants were selected from Japanese adults aged 20–84 years and those who responded to the survey advertisement were contacted by the corporation.[11] Healthcare professionals or social workers were excluded because of the potential bias for responding differently from the public. Additionally, the participants were selected to reflect the distribution of the population (national population census of Japan in 2015) with regard to sex and age. Our study sample size was set at 2,000 based on that of the previous study with the similar methodology.[5] Percentages of sex, age, marriage, employment, and risk factors including hypertension, diabetes, chronic obstructive pulmonary disease, chronic renal failure on hemodialysis, immunocompromised diseases, or on immune suppressants, and prefecture were compared between the participants and the national population census using chi-square test statistics. Prefecture size was defined into 3 parts; a large size prefecture means a prefecture with a population of 5,00,000 or more, a middle size prefecture means a prefecture with a population between 2,00,000 and 5,00,000, and a small size prefecture means a prefecture with a population of 2,00,000 or less.

2.3 | Data collection and questionnaire

We collected data on sex, age, chronic illness, family structure, and employment status. The questionnaire was developed following a consensus among the investigators based on the public opinion.[12] Each question sought to elicit public understanding and experience concerning healthcare use. Table 2 lists items of all questionnaires along with choices, and the items are classified into 4 parts. First, the survey asked respondents how much they understood the guideline (Q1). The second section of the survey asked them if they did not consider having a novel coronavirus infection when their symptoms did not match the "guideline" (Q2). In the third part, participants were asked their health condition (Q3) and behavior between February and May 2020, specifically cold-like symptoms (Q4-9). The last part dealt with telephone consultation and experience of healthcare use (Q10). For each of the questions, responses answered yes, no, or others (i.e., no idea for statements, refuse to answer) (Table 2). We also assessed variation in answers by respondent characteristics, such as age and sex. Intergroup differences in statistical data were assessed using chi-square tests for categorical variables, respectively. Descriptive statistics and percentages for proportions were used for the analyses.

TABLE 2 Questions and responses regarding national guideline and participant's behavior and experience

	N (%)
Q1: Did you know the "guideline"?	N = 2,137
Yes	1,698(79.5)
No	2,78(13.0)
Don't remember	161(7.5)
Q2: when youR SYMPTOMS dO NOT match the "guideline," do you think you did NOT have a novel coronavirus infection?	N = 1,698
Yes	422 (24.9)
No	1,170 (68.9)
Don't remember	106 (6.2)
Q3: Between mid-February and the end of May, did you notice any cold-like symptoms?	N = 2,137
Yes	144 (6.7)
No	1,982 (92.7)
Don't remember	11 (0.5)
Q4: Which medical services did you call after you became aware of the symptoms?	N = 144
Hospital or Clinic	46 (31.9)
PUBLIC Health center	29 (20.1)
Other	3 (2.1)
Didn't call	66(54.2)
Q5: Which health care provider did you call first?	N = 46
Primary care doctor	24 (52.2)
Foundation hospital	2 (4.3)
Other	19 (41.3)
Don't remember	1 (2.2)
Q6: Did you visit a health care provider after you became aware of your symptoms?	N = 98
Yes	25 (25.5)
No	71 (72.4)
Don't remember	2 (2.0)
Q7: Which medical institution did you first visit?	N = 25
Primary doctor	12 (48.0)
Foundation hospital	1 (4.0)
Other	12 (48.0)
Didn't call	0 (0.0)
Q8: Have you ever been refused a RT-PCR test for novel coronavirus by a public health CENTER, even though you are assessed you should have an examination by medical institution you visited?	N = 25
Yes	1 (4.0)
No	10 (40.0)
The hospital decided it wasn't necessary	14 (56.0)
Q9: Did you call the PUBLIC health CENTER between mid-February and the end of May 2020?	N = 2,137

(Continues)

TABLE 2 (Continued)

	N (%)
Yes	47 (2.2)
No	2,090 (97.8)
Q10: How many times did you call the health center and how many times did CALL UNTIL get connected?	N = 47
1 time	19 (40.4)
2 times	5 (10.6)
3–5 times	8 (17.0)
6–9 times	3 (6.4)
More than 10 times	5 (10.6)
Don't remember	2 (4.3)
Couldn't get a connection	5 (10.6)

3 | RESULTS

3.1 | Characteristics of participants and public perception of the guideline

A total of 2,137 participants completed the survey over a 3-day recruitment period in September 2020. Table 3 summarizes the sociodemographic characteristics of the participants; sex and all age groups in this survey well represent the 2015 national census.[13] The proportion of employed people was lower among the participants compared to the general population (study participants 35.8% vs. total 57.5%) and that of persons who lived in small-sized prefectures was lower among the participants compared to the general population (study participants 22.1% vs. total 29.7%) (Table 3).

Of all participants, 1,698 (79.5%) were aware of the guideline published by the Ministry of Health, Labour and Welfare. A higher proportion of participants among the younger age groups, both male and female, were unaware of the guideline: 29 males (23.4%) and 26 females (20.6%) knew the guideline in the 20–29 age group, whereas 18 males (8.7%) and 23 females (9.1%) knew it in the 70–84 age group. Of those who knew the guideline, 422 people (24.9% of 1,698) reported (i.e., misunderstood) that novel coronavirus infection could be ruled out when symptoms did not fulfill the criteria.

3.2 | Participant's health condition and experience

An overview of the presence of symptoms among participants between February and May 2020, and experience after symptom onset is shown in Figure 1. A total of 6.7% participants (144/2,137) experienced cold-like symptoms such as fever or cough from mid-February to May 2020. Among participants with these symptoms, 31.9% participants (46/144) contacted healthcare institutions and 20.1% (29/144) contacted local public health centers by phone, while 54.2% (78/144) did not contact healthcare institutions nor

TABLE 3 Characteristics of participants

Characteristic[b]	Study participants	Japanese population[c]
Sex (%)		
Man	1,041 (48.7)	61,841,738 (48.7)
Woman	1,096 (51.3)	65,253,007 (51.3)
Age (%)		
20–29 years	250 (11.7)	12,377,739 (9.7)
30–39 years	299 (14.0)	15,607,035 (12.3)
40–49 years	402 (18.8)	18,395,022 (14.5)
50–59 years	370 (17.3)	15,445,542 (12.6)
60–69 years	355 (16.6)	18,098,877 (14.2)
70–84 years	461 (21.6)	18,934,087 (14.9)
Risk factor (%)		
Have	736 (34.4)	N/A
Not have	1,349 (63.1)	N/A
Marriage (%)		
Done	1,455 (68.1)	62,625 (58.5)
Not done	682 (31.9)	29,242 (27.3)
No available information	0 (0)	15,175 (14.2)
Employment (%)		
Employed	764 (35.8)	58,919,036 (57.5)
Homemaker	524 (24.5)	15,206,558 (14.8)
Student	74 (3.4)	6,196,077 (6.0)
Unemployed/Retired	541 (36.3)	22,224,112 (21.7)
Prefecture Size (%)[a]		
Large size	1,376 (64.4)	68,471,371 (53.9)
Middle size	289 (33.5)	20,840,494 (16.4)
Small size	472 (22.1)	37,782,880 (29.7)
Total	2,137	127,094,745

[a]Definition of prefecture size. A prefecture with a population of 5,00,000 or more was considered as a large size prefecture, a prefecture with a population between 2,00,000 and 5,00,000 was considered as a middle size prefecture, and a prefecture with a population of 2,00,000 or less was considered as a small prefecture.
[b]Distribution of characteristics between the two groups except underlying disease: Chi-square tests were conducted for sex ($p = 0.999$), age ($p = 0.998$), marriage ($p = 0.001$), employment ($p = 0.007$), and prefecture ($p = 0.030$).
[c]As of National Census of Japan 2015.

local public health centers. Of those who contacted the healthcare institutions by phone, 52.2% of them (24/46) contacted their primary care physician. Among persons with symptoms who did not contact healthcare institutions or local public health centers, a total of 25 participants (25.5%) visited medical institutions. 14 of them (56%) did not receive RT-PCR test because of the decision by physicians in the hospitals or clinics, and 1 of them (4%) did not receive it because of the decision by local public health center despite of the doctor's assessment that the patient should undergo the test.

3.3 | Telephone contacts to local public health centers

Details of phone contacts to local public health centers are shown in Table 2. A total of 2.2% of all participants (47/2,137) tried contacting local health centers by phone irrespective of the presence of symptoms. Of those who contacted health centers, 40.4% (19/47) were able to contact them by a single phone call, but 34.0% (16/47) tried contacting them three or more times, and 10.6% (5/47) could not get a contact to them. Of those who were able to contact public health centers, 50.0% (21/42) were recommended to visit healthcare institutions such as primary care physicians.

4 | DISCUSSION

Early diagnosis of patients with suspected COVID-19 has a significant impact on the clinical course and spread of the disease and prompt testing along with tracing and isolation has been recommended by most scientific communities and public health organizations.[14] Policies to enhance early visit and testing for all symptomatic persons in the early stages of the epidemic play an important role in its containment.[14] However, our study revealed the fact that only 17% of symptomatic patients (25/144) visit healthcare institutions during the first wave of COVID-19 in Japan. In addition, among these symptomatic patients who could visit healthcare institutions, 60% (15/25) could not receive RT-PCR testing. These data suggested the fact that small fraction (17% times 60% = about 10%) of people with cold-like symptoms could reach testing in Japan. This study also showed the public's relatively high awareness of the 4-day rule guideline published by the Ministry of Health, Labour and Welfare (MHLW). Early diagnosis of patients with suspected COVID-19 also leads to rapid contact trace and isolation of contacts,[14] ultimately controlling COVID-19 in the community. Revision of guidelines along with full transparency and scientific reasoning plays an important role in the pandemic emergency.

The telephone lines of many local public health centers were busy during COVID-19 pandemic so that most people with symptoms had to contact the health centers repeatedly.[15] Local public health centers are government facilities responsible for public health in Japan and are operating under the MHLW to engage in a variety of tasks.[15] Before COVID-19 pandemic, local public health centers had already been overwhelmed with many works such as health screening, health promotion, environmental sanitation, and recording and analyses about statistics on community health.[16] During the COVID-19 pandemic, the reliance on an inefficient paper-based system for reporting patient information in local public health centers had also caused inaccurate and duplicate records.[16] Thus, it is necessary to improve their operations to reduce their tasks.

This study had several limitations. First, it was an online survey and did not employ face-to-face interviews with survey experts. It is also a self-reported assessment, which may overestimate its implementation because of social desirability bias, and the data may not

FIGURE 1 Cold-like Symptom development and experience among respondents
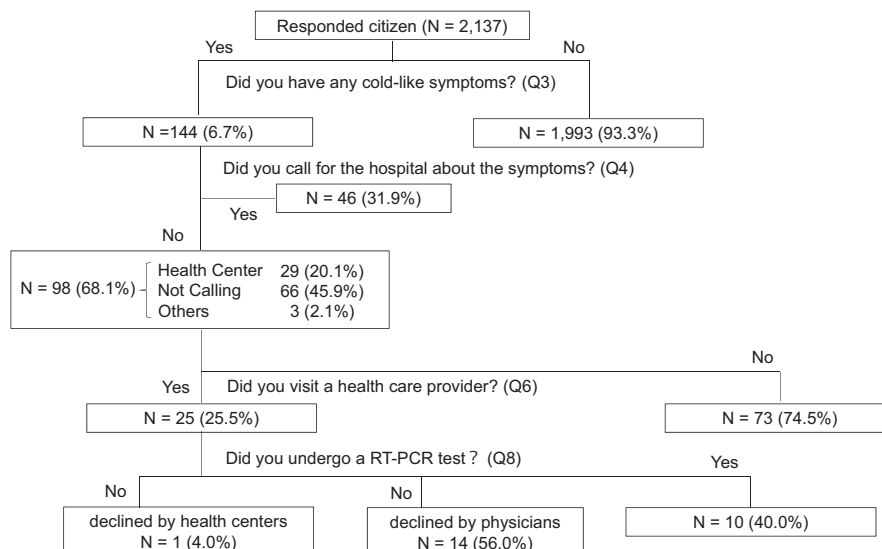
be accurate because of recall bias.[17] Second, because of the online questionnaire, the economically poor person may have had difficulty in accessing the Internet. There may have been a sampling bias in the population for this reason.[18] However, participants were selected with reference to the national population, using the sex and age distribution of each province as a reference point, although distribution of marriage, employment, and prefecture were significantly different between the participants and the national population. Finally, the survey was conducted on guidelines for healthcare use as of February. A revised version of guideline was issued in May 2020, and public understanding and experience may have changed thereafter.[5]

Our study is informative about public understanding and health center responses under the declaration of a state of emergency in Japan. In some countries such as China and South Korea, measures such as lockdowns and test, trace, and isolation were effective and immediately feasible.[19] On the other hand, a state of emergency was declared in April 2020 in Japan, with reliance on citizens' self-restraint and lack of law enforcement.[9] In addition, the capacity of RT-PCR testing was remarkably small; only 6,827 of RT-PCR testing were available daily in May 2020 in Japan, compared with 13,593 cases in December 2020.[20] In the early phase of the strategy against COVID-19 in Japan, testing capacity was limited and the 4-day rule guideline was implemented. However, sustainable and feasible long-term control of COVID-19 requires continuous review and improvement of the challenges to enable people and societies to keep activity them in their daily lives.

In conclusion, this is the first study to investigate the public's knowledge of the COVID-19 guideline and patients' experience during the first wave in Japan. Since early testing is important for timely diagnosis and treatment along with contact tracing, testing capacity should be increased to provide effective care for patients with suspected COVID-19 in Japan.

CONFLICT OF INTEREST
None declared.

ORCID
Masaru Kurihara https://orcid.org/0000-0001-9195-4202
Kazuhiro Kamata https://orcid.org/0000-0002-3479-2961
Kyoko Kitazawa https://orcid.org/0000-0001-8956-4432
Shunzo Koizumi https://orcid.org/0000-0002-9933-9607
Yasuharu Tokuda https://orcid.org/0000-0002-9325-7934

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