



COVID-19 RESPONSE



# **Global Learnings Evidence Brief**

## The Japanese Health System Response During the COVID-19 Pandemic

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# Introduction

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Since the beginning of the COVID-19 pandemic, the Japanese response has been a source of intrigue and curiosity. Initially, Japan appeared to be a positive outlier—as South Korea, Iran, and Italy were grappling with large outbreaks—but seemed to achieve this containment without implementing wide-sweeping lockdowns or mass testing. While there was consideration that the total number of cases remained low due to a low testing rate, Japan did not experience the surge of COVID-19-related admissions and deaths that had been witnessed across the world, suggesting that the spread of disease was contained for multiple weeks.<sup>1</sup> The outbreak on the Diamond Princess cruise ship, which docked in the city of Yokohama in mid-February, was an early test for the country.<sup>2,3</sup> Meanwhile, the public health system identified several clusters, which seemed to suggest the existing infrastructure was working.<sup>3</sup> At the end of February, Prime Minister Shinzo Abe closed schools until March, to coincide with the end of the national spring break for schools.<sup>4</sup> The summer Tokyo Olympics loomed large as the world awaited Japan’s decision about whether to postpone the global event, which Japan and the International Olympic Committee finally did in late March.<sup>5</sup>

Cases in Japan began rapidly rising in late March and, on April 7, Prime Minister Abe declared a state of emergency in Tokyo and its surrounding cities. This afforded their governors the right to issue stay-at-home policies. A week later, he expanded the state of emergency and these local powers to the entire nation, so each prefecture and city determined its own course of action.<sup>6</sup> When schools were allowed to reopen in early April, some opted to extend closures while others shifted students’ schedules to avoid travel during peak commute times.<sup>7</sup> But as April progressed, reports of hospital outbreaks and lack of personal protective equipment became more common. It was clear that COVID-19 was beginning to take a toll on the healthcare system. Big questions remained about how the Japanese public health and medical system, which had handled the first unusual yet nondescript wave, would respond to this more serious attack.

In this evidence brief, we posit that the two primary components of the Japanese health system response—the public health centers and designated infectious disease hospitals—were well-established to address smaller infectious disease outbreaks, but were inadequate to handle the surge of a rapidly-moving pandemic like COVID-19. With critical adaptations, the country was able to “bend but not break” as other public health strategies—such as social distancing, masking, and contact tracing—took effect to ultimately flatten the curve of infections and deaths. Here, we highlight the key lessons, strengths, and weaknesses of Japan’s COVID-19 health system response that may be useful both to Japan for future outbreaks and to other health systems and governments around the world.

## Methods

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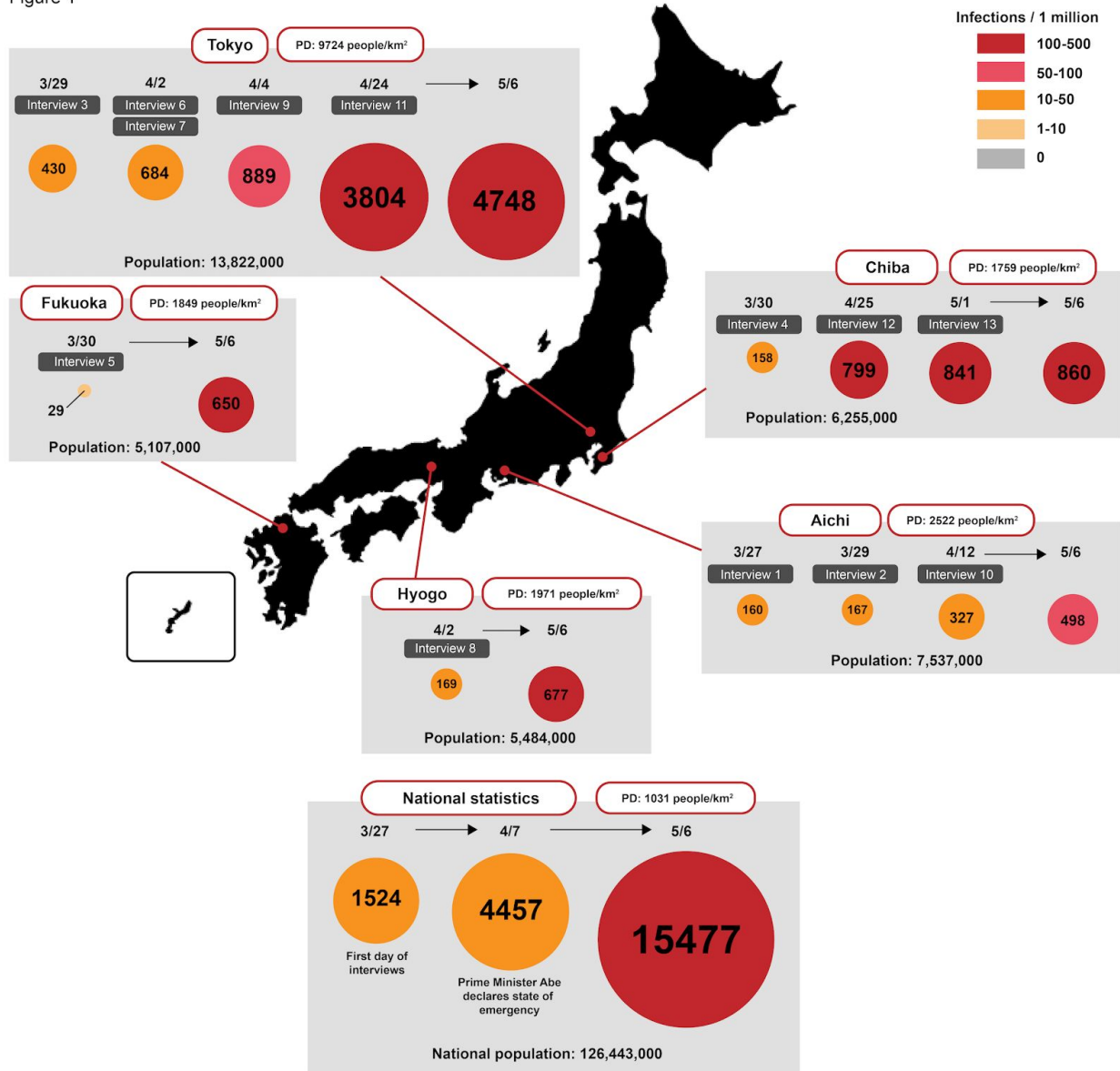
We conducted extensive verbal interviews of thirteen Japanese healthcare professionals practicing across a diversity of regions, clinical settings, and levels of hospital involvement in the nation’s response to COVID-19 pandemic (**Table 1, Figure 1**). Our primary goal was to understand the key features of the Japanese health system response to COVID-19 and to identify successes and areas for improvement. We collected detailed qualitative information from their observations and narrative experiences, as well as protocols and hospital policies. We synthesized the qualitative interview content and institution-specific protocols provided by the interviewees in order to summarize

key aspects of the Japanese healthcare system that shaped its initial response to the COVID-19 outbreak, adaptations being executed to achieve sustainable care amidst a rapid surge of cases, and challenges faced by Japanese healthcare workers (HCWs) today, as gleaned from first-hand accounts of front-line providers.

**Table 1.** Interviewee demographics

Interview	Date of interview	Prefecture	Home institution infectious disease designation status	Position and area of expertise/affiliation
Interview 1	3/27/20	Aichi	Non-designated	Physician, infectious disease
Interview 2	3/29/20	Aichi	Non-designated	Physician, primary care
Interview 3	3/29/20	Tokyo	Designated	Physician, infectious disease
Interview 4	3/30/20	Chiba	Designated	Physician
Interview 5	3/30/20	Fukuoka	Non-designated	Physician, palliative care
Interview 6	4/2/20	Tokyo	Designated	Physician, infectious disease
Interview 7	4/2/20	Tokyo	Designated	Nurse practitioner
Interview 8	4/2/20	Hyogo	Non-designated	Physician, infectious disease
Interview 9	4/4/20	Tokyo	Non-designated	Physician, infectious disease
Interview 10	4/12/20	Aichi	Public health center	Physician
Interview 11	4/24/20	Tokyo	Non-designated	Physician, emergency medicine
Interview 12	4/25/20	Chiba	Non-designated	Physician, emergency medicine
Interview 13	5/1/20	Chiba	Designated	Physician, emergency medicine

Figure 1



**Figure 1.** Geographic contextualization of interviews. First-hand insights were gleaned from thirteen Japanese healthcare professionals practicing across a diversity of geographic regions with varying numbers of confirmed COVID-19 cases. Population data based on 2018 data. PD = population per habitable area (people / km<sup>2</sup>).<sup>8-10</sup>

# Japan's Two-Tiered System

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From our interviews, two unique features of Japan's healthcare system stood out amidst the country's management of the COVID-19 pandemic. The first of this two-tiered system were the presence of regional public health centers—governmental entities under the auspices of the Ministry of Health, Labor and Welfare (MHLW)—which serve as proximal triage centers tasked with funnelling suspected and confirmed COVID-19 patients to the appropriate care destinations. The second arm, directly downstream, were the governmentally and legally designated hospitals for specialized infectious disease care, which were tasked with receiving COVID-19 patients as they were triaged by public health center personnel. These two pieces of the Japanese healthcare system acted synergistically in the country's initial response to the outbreak but evolved under the pressure of rising case numbers to contend with a second wave of infections.

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## The Public Health Center

The public health centers (PHC, *Hokenjo*) are local governmental entities placed across Japan's prefectures, each directed by a physician and staffed by a team of interdisciplinary professionals, including public health nurses, midwives, veterinarians, pharmacists, and clinical laboratory technicians.<sup>11</sup> There are more than 469 PHCs as of April 2020, each one serving up to millions of regional residents to provide a wide range of public health services, including rare diseases support, early detection of domestic violence, and oversight of hospitals and pharmacies. The PHC for decades has been part of the Japanese healthcare system, first emerging from the 1927 Public Health Center Act (amended to “the Community Health Act” in 1994) with a more focused, but still broad, scope of infection control and management of infectious diseases such as tuberculosis as well as nutrition and maternal and child health. Amidst the rapid economic growth and industrialization of Japan following World War II, the functions of the PHC were dramatically expanded to include areas such as food sanitation, environmental health, and water sanitation (Figure 2).

Since the initial outbreak of COVID-19 in Wuhan, China, and Japan's involvement in the outbreak aboard the *Diamond Princess* cruise ship, the PHC served arguably one of the most central roles in the regional response. According to the literature and our interviews, the PHCs single-handedly managed three critical responsibilities: patient triage, PCR testing, and regional cluster surveillance (Figure 2). Under the direction of the MHLW in early February, PHCs in each prefecture established regional call centers (formally named “Returnee and Contact Call Center”), which were publicly available phone lines that connected callers to a triage desk primarily operated by PHC staff.<sup>12</sup> Rather than self-referring themselves to a local hospital, emergency department, or clinic, citizens were initially advised to contact these call centers if they met certain criteria, such as prolonged fever (37.5°C or more for four days or longer), fatigue, respiratory symptoms, or had risk factors such as advanced age and comorbidities (e.g. diabetes, heart failure, respiratory illness, immunocompromised status). Following this contact-free initial triage, the PHC directed a subset of these patients to undisclosed COVID-19-dedicated outpatient clinics established within select regional hospitals, for further assessment by a medical provider. From February 1 to March 31, this system recorded a total of 313,475 phone-based consultations and 16,730 visits to COVID-19 clinics across the nation.<sup>13</sup> Once patients were assessed and confirmed to be COVID-19 positive, the PHC further facilitated their transfer to specified hospitals equipped with the resources, personnel, and experience to manage inpatient-level infectious disease care. In response to the shortage of resources in some regions, some PHCs had to undertake additional roles

beyond their official core functions, including but not limited to providing physical patient transportation to clinic sites and doubling as an occupational health equivalent for hospitals managing HCW infections.

*“Patients [who have concern for COVID-19] have two options: to call the call center at the PHC or they end up walking into a hospital or clinic. They would never directly go to the designated COVID-19 clinic, as it is not disclosed to the public which hospitals house these special clinics and all of the referrals are done by the PHC. If a local clinic provider suspects COVID-19 [in a patient], a call comes into the PHC, and we direct them on which COVID-19 clinic to send them to.”*

**- Interview 10** (Physician, employed at Public Health Center, Aichi)

*“In the case of a close contact exposure [for a health care worker], our regional/affiliated PHC will actually be the one to manage these cases. In general, after their two weeks of quarantine and/or monitoring, if they do not have any symptoms, they are okay to come back... although the ultimate decisions on the length of time off... such as whether we give them extra time [beyond two weeks] off from work... falls on the individual hospital... The weight of the opinions of the PHC is very strong. They typically don't mobilize until [the case is confirmed for] a positive COVID-19 status... but once it is positive, they give us a lot of orders/recommendations.”*

**- Interview 2** (Primary care physician, non-designated hospital, Aichi)

Beyond this vertical triaging, the PHCs and related regional public testing laboratories also served as the primary gatekeeper for all COVID-19 PCR diagnostic testing, ranging from samples from outpatients in the initial triage stage to samples from inpatients, and even testing for potentially exposed and infected healthcare workers across various healthcare institutions.<sup>14</sup> This continued until commercial PCR testing became covered by national health insurance on March 6. Following this change, commercial laboratories scaled up their operations, though there were concerns about the speed at which they were able to do so. As of May 7, 2,000-5,000 administrative tests and 1,000-3,000 commercial tests were conducted each day.<sup>14</sup>

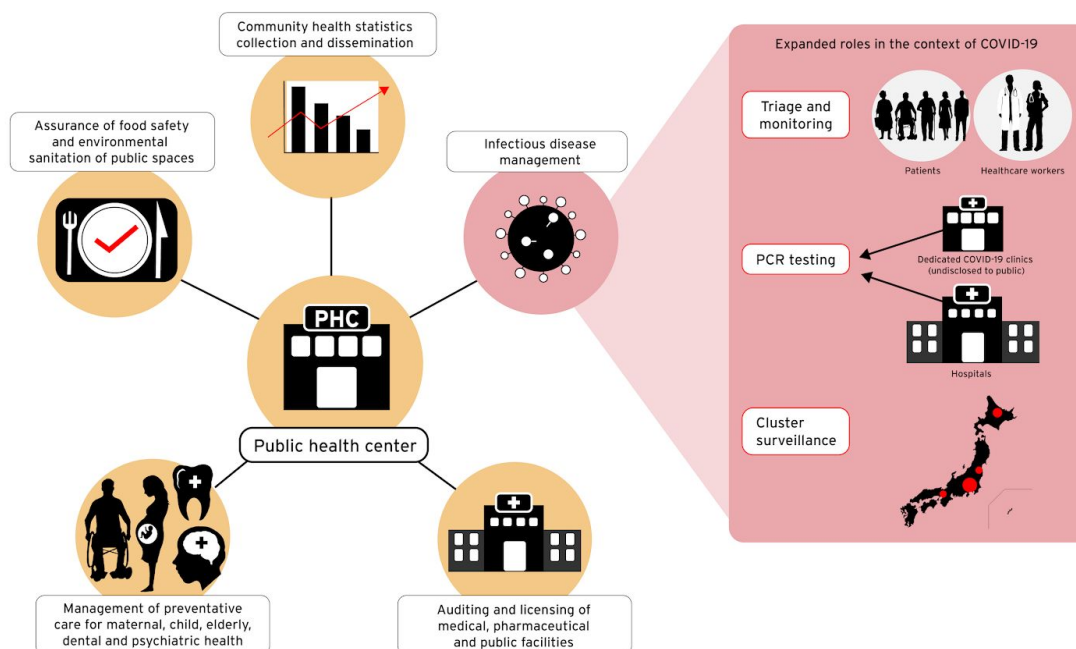
*“We [physicians] can give our preferences [for the tests we want to get done], but the final decision is made by the PHC. The PHC seems to be considering things like their testing capacity in deciding who can get testing... It also seems like they are assigning prioritization statuses [to certain tests] here as well... if it is an important test for a ‘dangerous’ case, it has come back as early as half a day, but for other cases it can range from 24 hours to a day and a half. It seems like they are also prioritizing the testing for cases that might evolve into a larger cluster.”*

**- Interview 2** (Primary care physician, non-designated hospital, Aichi)

Finally, the PHC was also tasked with the larger epidemiological role of implementing Japan's “cluster-based approach,” which placed the focus on proactive contact tracing and isolation of possible contacts from small regional clusters that were hypothesized to be seeding the spread in Japan. One interviewee working at a PHC reflected that this unique strategy was actualized by the country's long history against tuberculosis, during which the local PHC staff, regardless of their speciality, were educated on basic contact tracing techniques. These skills developed during early tuberculosis management could be applied to the current outbreak. In this way, the PHC was the common node of external triage for all regional civilians, and became also a liaison and consultant for regional hospitals and the workhorse in cluster surveillance and contact tracing for entire geographical regions.



Figure 2



**Figure 2.** Visualization of the roles of the public health center amidst the COVID-19 crisis. The official roles of public health centers (PHCs) range from environmental, food, maternal and child safety to management of infectious disease. The sudden expansion of responsibilities in the setting of the COVID-19 threatens the sustainability and capacity of the PHC.

## Designated and Non-Designated Hospitals

While the PHC was a key stakeholder in serving as a centralized triage center, especially during the early phases of the COVID-19 pandemic in Japan, an equally critical component were the hospitals that ultimately accepted the patients that were referred by PHC personnel. In Japan, governmental and legal definitions of hospitals separated them into either “designated” or “non-designated” sites for infectious disease care. Those conferred the “designated” status received funding and resources to be the frontline centers of care for outbreaks of infectious diseases like COVID-19 and its historical precedent, H1N1 influenza.<sup>15,16</sup> Legally endorsed by the Act on the Prevention of Infectious Diseases and Medical Care for Patients with Infectious Disease, this classification system isolates the exposure to COVID-19 to the most experienced healthcare workforce and where there was a concentration of infectious disease resources.

The Act on the Prevention of Infectious Diseases and Medical Care for Patients with Infectious Disease was established in 1999 to “provide for necessary measures concerning the prevention of infectious diseases and medical care for patients with infectious diseases in order to prevent outbreaks and the spread of infectious diseases.”<sup>16</sup> This classification system of infectious disease hospitals further stratified the “designated” hospitals into specialized designation, type 1 designation, and type 2 designation. In Japan, four hospitals had a specialized designation, 55 with type 1 designation, and 634 hospitals with type 2 designation (including those with special designation for tuberculosis) as of April 1, 2019.<sup>17,18</sup> Under this medico-legal framework, “all level 1 and specified hospitals are required by law to prepare at least one or more isolation units for patients with highly infectious

diseases.”<sup>19</sup> Specialized designation hospitals and type 1 designation hospitals made up roughly 0.7 percent of all hospitals in Japan and had one to four beds located in high-level or general isolation units.<sup>17,18</sup> These definitions predating the pandemic contributed unique insights and challenges to the healthcare system when COVID-19 began to spread in Japan.

These designations were definite strong points in the beginning of the outbreak. When COVID-19 was given a one-year status as a designated infectious disease by the Japanese government on January 28, 2020, the management of this novel disease became subject to this classification system. As evidenced by our interviews with providers at designated hospitals, their generational experience with specialized infectious disease care—particularly with active tuberculosis—had prepared them to streamline their capacity-building process. The most seasoned hospitals, such as those among the four select “specialized designation” status facilities, reported that they were able to apply pre-existing institutional infection control protocols and strategies (e.g., physically separate hospital entry and pathways within the hospital to distance suspected COVID-19 patients from others receiving care), circumventing the logistical hurdles of altering hospital practices to meet new demands. Several designated hospitals had pre-existing dedicated “TB wards” (standardized with negative pressure rooms and specially trained staff) that they quickly transformed into “COVID-19 wards,” transferring their active TB patients to other hospitals to maximize bed capacity. Designated hospitals were singularly prepared and expertly able to respond to infectious disease needs at the onset of COVID-19 cases in Japan.

*“As an institution, we have a mission to be leaders in infection control and prevention, so we have rigorous standard protocols. During the MERS outbreak in South Korea, cases were overflowing, and there were many patients being admitted. We had to prepare how to receive, hospitalize and treat them. Since then we have continuously been building on how we can commit to the work of influenza and MERS. There have not been any new pathways [to separate patients by COVID risk] or new systems put in place. We can use our previous hospital standards and we modify as we learn about effective control measures for COVID-19.”*

**- Interview 6** (Infectious disease physician, designated hospital, Tokyo)

With the PHC and this hospital designation system as the two cogs of a well-oiled machine, a systematic, vertical triage system was in place for COVID-19: the PHC directed all COVID-19-confirmed patients to undisclosed outpatient clinics for initial evaluation and testing, then they funnelled patients exclusively into designated medical institutions for a government-mandated minimum two-week stay. Importantly, this care pathway was initially required for all COVID-19-confirmed patients regardless of symptom severity, and the requirement of two negative PCR tests prior to discharge often extended their hospital stay for a month or longer. The goals of this approach were to maintain privacy, isolate cases, and concentrate COVID-19-related care to the most experienced facilities and clinicians while shielding other hospitals and patients from inadvertent exposures—a highly concentrated and exclusive pathway of care that initially appeared successful in hindering the spread.

## COVID-19: The Two-Tiered System Under Strain

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With this two-tiered triaging system operating in every prefecture, Japan initially appeared to circumvent the surge of COVID-19 related admissions and deaths witnessed across the globe, suggesting that the spread of disease truly was contained for a span of weeks. However, a more ominous chapter began to unfold in late March and early April, marked by a second, larger surge of cases, particularly in major cities like Tokyo. With it, Japan joined the league of

countries faced with devastating consequences of COVID-19: the economic blow of nationwide social distancing, followed by the postponement of the Summer Olympics, exacerbated the already fragile and contracting economy; a crisis within the healthcare system, which was dangerously close to becoming overwhelmed; and the potential for catastrophic health outcomes in a country with 27.6% of the population over the age of 65.<sup>20,21</sup>

The warning signs of a healthcare system unprepared for the surge of patients started in early April.<sup>22</sup> These strains were seen in different aspects of the system, revealing different areas of weakness ranging from detection to triage and management. Struggling to meet the demands of the rapidly increasing case counts, the public health centers quickly became bottlenecks for testing capacity, built on a system that made it difficult to scale up the testing volume amidst the second surge. This was compounded by the government's initial stance toward diagnostic testing, which was strictly reserved for those with evidence of pneumonia. These factors likely enabled undetected widespread transmission by leaving asymptomatic cases in the community.

Designated infectious disease hospitals, despite being equipped with the resources, personnel and experience for specialized care, became stretched thin from COVID-19-positive patients who, by mandate, had filled their beds for multiple weeks, even if they only had mild disease. As patients overflowed into non-designated hospitals and municipal governments put out desperate calls for their regional hospitals to expand their capacity, it became increasingly apparent that the non-designated hospitals—in contrast to their designated counterparts with a wealth of expertise—were vastly unprepared. They were “likely not equipped to be a frontline care site for large numbers of COVID patients” (interview 11, emergency physician, non-designated hospital, Tokyo) and lacked the resources, space, and systems to protect both patients and healthcare workers from the spread of COVID.<sup>23,24</sup>

*“Designated hospitals are not designed to handle a surge of patients who may require negative pressure rooms or ventilators. They are simply designated to isolate these patients. Therefore, as the patient numbers increased in late March, we could not accommodate these patients, and they had to be accepted at non-designated hospitals around us.”*

**- Interview 13** (Emergency physician, designated hospital, Chiba)

The strain placed on the siloed COVID-19 response system began having a ripple effect on the broader national healthcare system, including critical elements of the emergency care network. EDs quickly developed triage and isolation protocols for confirmed and suspected patients with COVID-19 as well as ensuring adequate PPE availability. However, the limited availability of negative-pressure rooms (only four to eight in >800 bed hospitals) hindered their ability to feel confident in caring for patients with COVID-19, even in designated infectious disease hospitals. Many community hospitals began to reject all febrile patients (despite the Japanese law barring physicians from refusing to see patients without just cause), not only limiting access to care for COVID-19 patients but also for longstanding patients who relied on these facilities to obtain care for chronic conditions -- a harsh reality that further strained the healthcare system and its ability to meet the needs of the pandemic.<sup>25</sup>

The lack of facilities able to accept patients suspected of COVID-19 became a major problem. Given that non-designated hospitals did not accept patients potentially suffering from COVID-19, designated infectious disease hospitals needed to accept all such patients. Unlike in the U.S. where the Emergency Medical Treatment and Labor Act (EMTALA) necessitates acceptance of all incoming ambulances by EDs, Japan's emergency response system allows EDs to accept patients based on their own discretion.<sup>26</sup> To prepare for the sudden increase of patients with COVID-19, multiple EDs resorted to restricting admittance to certain patients.<sup>27</sup> This protective measure unfortunately added to the pre-existing problem of ambulances being turned away by EDs. When cases surged and non-designated hospitals were asked to accept patients suspected to have COVID-19, emergency physicians from non-designated hospitals commented that they “only wish [designated infectious disease hospitals] had more capacity to accept all of these patients” because halting regular hospital operations to accommodate patients with

COVID-19 would “quickly bankrupt” the hospitals without the level of public funding and resources of the designated hospitals. Emergency physicians were constantly under pressure to ensure no outbreaks of COVID-19 occurred in the hospitals, which would necessitate a hospital shutdown. Given the limited availability of negative-pressure rooms, lack of adequate personal protective equipment (PPE), and lack of existing isolation protocols for infection control in the emergency departments (EDs), both designated and non-designated infectious disease hospitals felt unprepared for this pandemic.

*“Because of the prolonged duration of COVID, small hospitals are closing or not accepting possible/suspected COVID patients. Therefore, we will have to see more of these patients but we don’t have enough capacity to meet the demand. Ambulances cannot find an accepting hospital, which seems to be exacerbated by the current COVID crisis. Therefore, the hospitals that are working hard to accept these patients are getting financially more difficult to maintain (not enough reimbursement for caring for these patients, in the setting that normal profitable operations are halted). The government has no authority to require hospitals to accept patients. Hospitals can’t accept patients because they have no capacity. So I’m worried that if a surge of patients occur like it did in the U.S., we won’t be able to care for them.”*

**- Interview 13** (Emergency medicine physician, designated hospital, Chiba)

As a less-discussed consequence of increasing caseloads amidst an overwhelmed system, Japan faced increasing reports of infected healthcare workers and hospitalized patients. This prompted hospitals to shutter its outpatient facilities as many hospitals housed clinics in the same building as their inpatient facilities.<sup>24</sup> In Osaka, Japan’s third largest city, medical professionals accounted for 10 percent of COVID-19 cases within the prefecture, highlighting the significant issue of transmissions within the hospital setting, which has also been reported in other centers.<sup>28,29</sup> Such data underscored the urgent need for the standardization and dissemination of infection control and healthcare worker protection protocols across all hospitals, regardless of designation status, so that the expansion of hospitals handling COVID-19 did not jeopardize the safety of frontline providers and other patients.

## An Evolving System: Replacing the Vertical Triage with Horizontal Collaboration

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Seasoned by their wealth of experience with infectious diseases, Japan’s government and hospitals had historically been prominent cogs in a well-oiled vertical triage system, which initially had success in preserving COVID-19-related care to the most experienced facilities and clinicians, protecting the public and healthcare workers from unnecessary exposures to the virus. However, the COVID-19 pandemic exposed and magnified the vulnerabilities of health systems around the world—and with the second wave of infections, Japan was no longer an exception. The public health centers became increasingly overwhelmed bottlenecks while the resourced designated hospitals strained under a heavy load of rising cases. Meanwhile, patients spilled over into an underprepared second line of non-designated hospitals.

Nevertheless, in a rapid response spearheaded by local PHCs, various stakeholders in Japan’s healthcare system began reshaping this top-down triage system into a horizontal coordination system that engaged PHCs, local

governments, professional organizations, outpatient clinics, and all regional hospitals in united action (Figure 3). Leveraging their legacy as regional health authorities, public health centers facilitated this shift: they called upon privately-owned hospitals—making up an overwhelming majority (almost 70%) of all healthcare facilities in the nation—to accept some portion of suspected patients to alleviate the load on designated hospitals.<sup>30</sup>

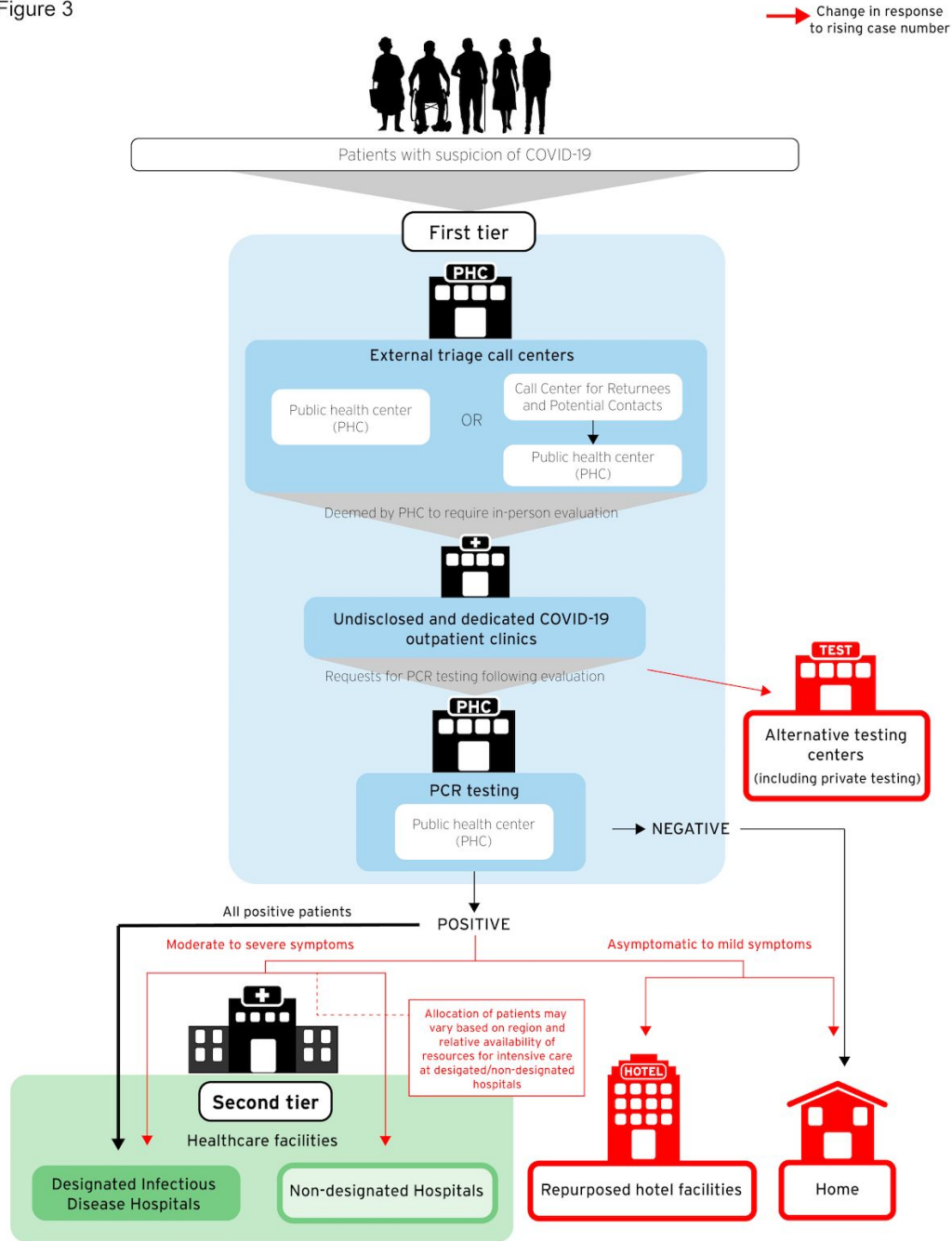
Japan likewise shifted its patient care protocols to make use of this now wider network of available facilities. Japan initially had a policy of a mandatory two-week hospitalization of asymptomatic COVID-confirmed patients, as well as compulsory hospitalization of mild cases until they had two negative PCRs, which could stretch hospital stays from weeks to a month.<sup>31</sup> Recognizing this enormous healthcare waste, prefectural governments collaborated with the PHCs to repurpose hotel rooms as temporary care facilities for those who could be managed safely outside of the hospital. On April 2, 2020, the strict guidelines surrounding hospitalization were lifted, and an increasing number of regional PHCs began to triage patients across a wider repertoire of care settings, including safe management of asymptomatic or mild cases at home, hotels, or alternative overnight stay facilities, and sending moderate to severe cases to the hospitals. Other stakeholders, in response to the pressing situation, also adopted their own capacity. For example, in Tokyo, the Tokyo Medical Association—the professional organization mainly composed of local primary care physicians—opened their own PCR testing centers in April to address the delayed turnaround time of other PCR tests.<sup>32</sup> While preference was made for more severe cases to go to the designated hospitals with the most infectious disease resources, there were some regional differences of this triage process, as some non-designated hospitals were better suited to accept critically ill patients due to their bigger intensive care capacity.<sup>33</sup> (Figure 4)

The fleet of non-designated hospitals, largely shielded from the COVID-19 response up until now, began to respond to local governments' pleas by accepting increasing numbers of confirmed patients—though this was variable, with a sizable portion of hospitals still declining participation due to lack of specialized resources (e.g., negative pressure rooms) and infection control infrastructure to protect its workforce and non-COVID patients. As both designated and non-designated hospitals expanded their bed capacities for patients suffering from COVID-19, as of May 2020, the caseload fortunately did not exceed their capacity.<sup>34</sup> This horizontal engagement and utilization of medical facilities and partners outside of planned infectious disease control and prevention was an expansion rooted in the two essential elements of the Japanese infectious disease response: the PHC and the hospital designation.

*“Initially, we were trying to not let [COVID-19 cases] in, we were trying to not even see them... there are different types of hospitals when it comes to COVID-19 care. There are designated hospitals at the center, and these are required by law to take in COVID-19 patients, right from the beginning. We have other local public/community hospitals on an outer ring. Even further outside are the specialized high-level care facilities—I think there are maybe 10, or 20, in Tokyo—these don't do infectious disease care, and in our case, we do transplant [surgery]. For these hospitals, the general stance is that we don't want to see COVID-19 patients, as it immensely reduces our capacity [for other care]. COVID-19 care is something our institution is not used to seeing, yet will require large resources that limit other forms of care [that we provide specially], endangering our ability to run the hospital... however, the situation is changing, pressuring us to a point where we have no other option other than to take in patients... within the past two days, the situation in Tokyo has become more severe, and we have received several briefings and orders from the municipal government for the various concentric rings [of hospitals] to secure certain numbers of beds according to the stage of the pandemic. As of yesterday, we have secured six beds in the ICU and one general inpatient floor—so we are prepared to take in six severe cases and approximately 20 moderate cases.”*

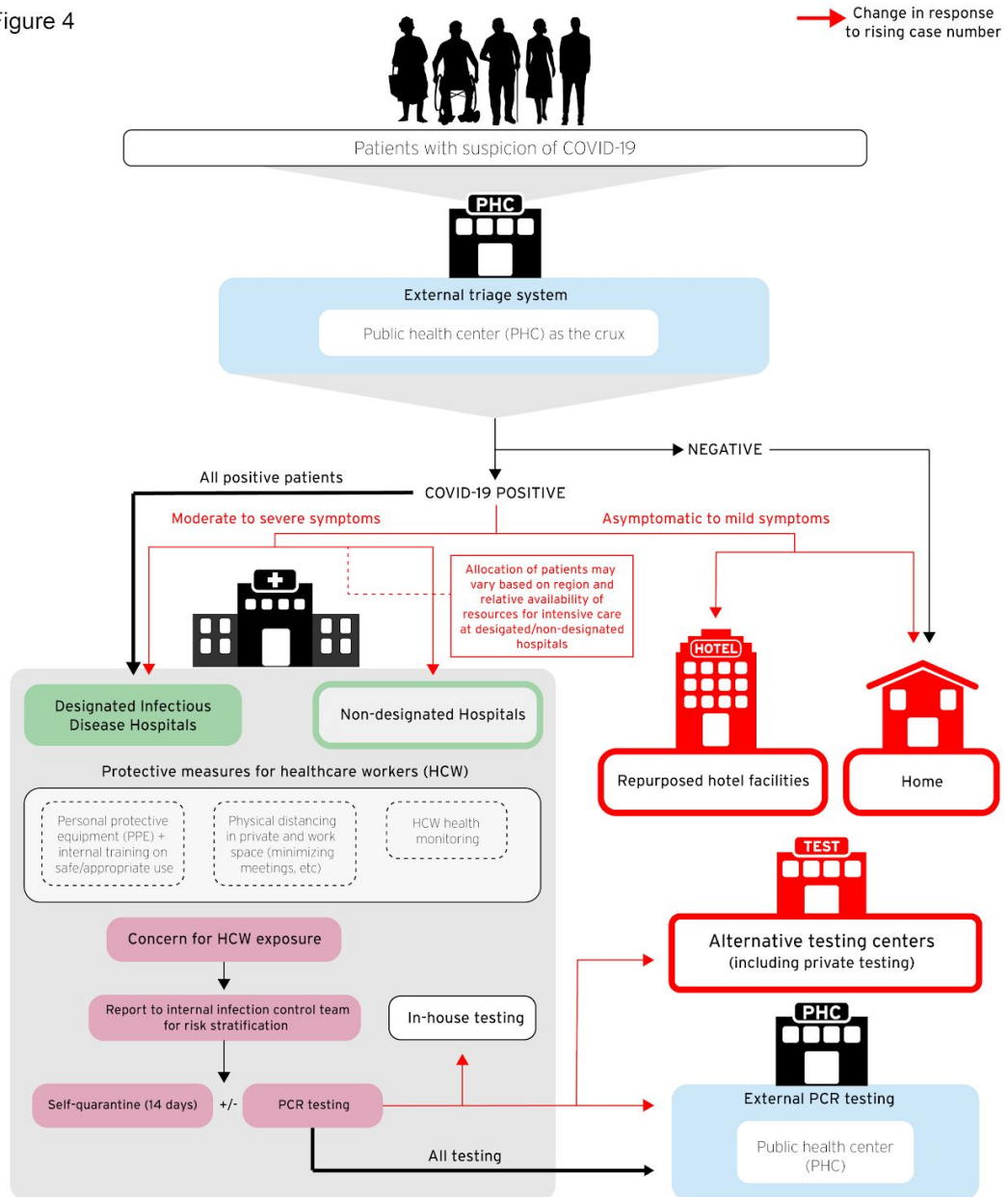
**- Interview 9** (Infectious disease physician, non-designated hospital, Tokyo)

Figure 3



**Figure 3.** Two-tiered system of the Japanese approach to infectious disease. Japan’s original response to the COVID-19 was characterized by two tiers of action—proximal triage of suspected COVID-19 patients by the regional public health centers (PHCs), and the admission and care of confirmed patients by “designated” hospitals for specialized infectious disease care. Rising case numbers presented an urgent need for PHCs to allocate patients across a wider network of care sites, as well as expand the availability of alternative testing sites.

Figure 4



**Figure 4.** Classification of Japanese Healthcare Facilities. In the initial stages of its response, specially designated hospitals were the sole referral centers for COVID-19-related hospitalizations, with a majority of PCR testing for healthcare worker infections being conducted by the public health centers (PHC). Rising caseloads have prompted the triage of patients into non-designated hospitals as well as alternative destinations such as repurposed hotel facilities for milder cases.

## Strengths of the Japanese Health System Response

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Our investigative work, infused by the direct perspectives of frontline providers, enabled us to uncover less commonly discussed factors in Japan's national response to COVID-19. The first was an established framework for infectious disease response—a two-tiered system, shaped by Japan's historical battles with tuberculosis and other communicable diseases and rapidly deployed by the central government, which effectively circumvented the hurdles of carving out a new emergency preparedness plan for its healthcare system. Despite weaknesses that became more visible with the rising caseload, the narrow triage pathway created between the PHC and a select group of well-equipped hospitals may have quelled an initial wave to some degree. Secondly, the execution of this system at the local level through the regionalized PHCs, in coalition with their local hospitals, may have allowed more responsive responses to the locally changing conditions of the pandemic. As extensions of the centralized Ministry of Health, Labor and Welfare embedded deeply in individual prefectures and local communities, the PHCs were able to adapt relatively quickly—likely better than a centralized, national public health entity. Japan's national infectious disease preparedness, bolstered by local responsiveness and leadership from the regional public health sector, comprise the strengths in the nation's response.

*“Without the presence of PHCs, this management [by Japan] would not be possible... having one CDC is powerless, and the greatest strength lies in organizations with consistent human resources who are close to the community and can deal with issues in their immediate vicinity.”*

*- Interview 10 (Physician, employed at Public Health Center, Aichi)*

## Challenges of the Japanese Health System Response

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While the advancements made daily in Japan's approach were commendable, significant challenges remain in the shifting coalitions of PHCs and healthcare facilities that reveal disparate capacities and preparedness levels to respond to sudden outbreaks of infectious disease, as in the instances of the steep rise in COVID-19 patients.

Echoing the lessons highlighted in the 2009 H1N1 influenza pandemic and the Great East Japan Earthquake of 2011, the COVID-19 crisis once again illuminated the wide gap between public health preparedness planning at the national level and the inadequate resourcing for implementation at the local level. While a recent OECD review praised Japan's overall emergency preparedness system as “fairly robust” and pandemic preparedness as “at a good level,” the strain placed on the individual regional PHC was painfully apparent—creating inevitable delays and limitation in testing volume that have become targets of harsh public criticism.<sup>35</sup>

This issue was both pervasive and multifactorial. First, there was a historical underinvestment of PHCs, while expanding the purview of PHCs over increasingly vast populations and progressively reducing their numbers from 845 in 1996 to 469 in 2020.<sup>36</sup> Second, there was a shortage of trained candidates to fill PHCs and a systemic undervaluing of public health education among the healthcare field. For example, master's degree programs in public health have only been in existence for two decades in Japan, with only five institutions accredited as professional graduate schools.<sup>37</sup> The need for Japan to bridge this gap through increased investment in public health education and establishment of PHCs has never been more clear. More immediate steps are required to allow existing PHC personnel to meet their ever-increasing demands and make their role a realistic one. In order for PHCs



to sustainably triage large numbers of patients to the most appropriate care destinations, they must simultaneously offload some of their responsibilities, including gatekeeping roles in diagnostic testing, to local clinics and hospitals—an adaptive step only possible through national efforts to increase in-house testing capacity among individual healthcare institutions. Building on the national preparedness afforded by its prior experiences in infectious disease management, emergency response funding may be necessary to quickly mobilize crucial public health and healthcare resources amidst this and future pandemics.

*“[A major challenge is] the shortage of governmental personnel. There is an overwhelming shortage of manpower. If someone at the PHC gets sick, we cannot continue this current strategy of management... and none of our tasks are amenable to teleworking.”*

**- Interview 10** (Physician, employed at Public Health Center, Aichi)

Furthermore, the recruitment of non-designated hospitals for regional COVID-19 management has remained inadequate—creating a stark juxtaposition between the overcrowded designated hospitals and the non-designated institutions with precious unfilled inpatient beds and progressively emptier and emptier emergency departments. As a new stakeholder in a regional healthcare coalition, non-designated hospitals must receive the resources to succeed. Expedited sharing of proprietary protocols regarding COVID-19 patient care and healthcare worker protection should be coupled with creative deployment of human resources, such as sharing of infection control and intensive care expertise through tele-consultations. Importantly, gaps in resource allocation were observed on the side of the designated hospitals as well. While designated hospitals had the bed capacity and life-sustaining machines to perform intensive care, many urgently needed intensivists who happened to be working in non-designated facilities that were not yet accepting COVID-19 patients. Thus their invaluable expertise and skill set were unused when they may have been needed most. Deliberate dissemination and allocation of intellectual capital would increase the overall capacity of health facilities across the country to respond to the surge of cases.

*“I’m worried about not having isolated routes for patient transport within the hospital and walled rooms in the entire hospital. I don’t think we are able to care for COVID patients safely--hospitals like ours should have more capacity to handle infectious disease patients like COVID.”*

**- Interview 11** (Emergency medicine physician, non-designated hospital, Tokyo)

*“We have rooms, we have machines. There isn’t a shortage of ventilators. Compared to other countries, we have more bed capacity in our hospitals. [...] What we lack the most is people. Then education and training. What we really have a shortage of are specialists. We do not have enough intensivists. We lack the ability to coordinate the distribution of vital resources to places that need them. For example, there are many ECMO specialists at Hospital A, but if the head of the infectious diseases at Hospital A is hesitant to take on COVID patients then these specialists cannot commence care for COVID patients. The specialists cannot go to where the COVID patients are. Doctors who are presently caring for COVID patients will have only their knowledge and skillset to draw from, and those doctors who have specialized knowledge in ECMO cannot make their skills of use there.”*

**- Interview 6** (Infectious disease physician, designated hospital, Tokyo)

Finally, Japan’s progress remains a patchwork of isolated changes within individual prefectures, with inadequate collaboration across regional lines to achieve a united national effort. This is due, in part, to an archaic information infrastructure that continues to rely on fax machines and documents stamped in ink as signatures—deeply ingrained relics of the past that impede the flow of critical data, such as bed capacity and number of infected patients and

healthcare workers, between regional health authorities. The problems hampering teleworking efforts in the nation's corporate world are the same barriers impeding the dynamic changes so urgently needed in Japan's public health and healthcare systems.<sup>38</sup> To execute a coordinated region-wide system, the integration of this fragmented reporting system and expedited establishment of a standardized, digital health information ecosystem are critical. Within this updated information network, data bolstered by wider testing should form a feedback loop to help public health officials and health system leaders rapidly learn and adapt. In addition to expedited investment into the digitization of communication, other creative solutions for strengthening intra- and inter-regional information transfer may include online platforms for healthcare professionals to share their experiences and lessons learned and dashboard tracking systems to better visualize the ebbs and flows of hospital resources in real-time.

## Conclusion

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Initially envisioned as a medium to identify strategies employed by Japan to prevent healthcare worker infections, our interviews provided an unexpected lens into the nuances of the nation's healthcare infrastructure, and perhaps more importantly, both its strengths and weaknesses made apparent by the COVID-19 crisis. By capturing these firsthand perspectives at an inflection point in Japan's COVID-19 narrative, we were able to gain insight into the real-time adaptations made in this existing—and in many ways historical—system to then craft informed analyses of the unmet challenges that lie ahead.

As Japan made dynamic steps to adapt the architecture of its medical care and public health systems, the rate of new infections slowed along with a lower-than-expected level of COVID-19-related deaths, indicating that some of these systems changes along with improved community mitigation measures like social distancing may have had a positive effect.<sup>39</sup> However, the path forward is still long and uncertain, as evidenced by other countries across the globe. Whether this success in containing the second wave will continue will depend in large part on Japan's ability to meet the ongoing challenges outlined in this brief.

The grim statistics from major global outbreaks have already exemplified that urban centers risk disaster if they fail to reimagine and reorganize their regional delivery of healthcare. No nation can afford to be complacent in these volatile circumstances. Indeed, the Japanese health ministry predicted a death toll reaching 400,000 without virus containment measures, according to a Japanese media report on April 15.<sup>40</sup> Standing at a critical inflection point in their narrative, Japan must continue to deploy swift and dramatic shifts in their approach to expand its healthcare capacity and harness all available resources to absorb the rising caseload.

# Key Lessons

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- **Regional coordination and load balancing across hospitals, as well as dynamic flexibility of resources within hospitals, are critical for adapting to a rapidly evolving crisis like COVID-19.** Japan's dynamic COVID-19 trajectory was characterized by early exposure through the widely publicized cruise ship outbreak, a relatively mild initial wave of community spread and cluster outbreaks, and a second surge of cases that put its national public health and healthcare response to the ultimate test. The health system needed to break free from its existing infrastructure and expand functions such as testing and bed capacity in order to quell the surge. Furthermore, it also needed to involve the non-designated hospitals in order to handle and distribute the influx of cases.
- **During crises, regionalized public health systems should be given local authority to coordinate across key regional stakeholders.** Under a second wave of cases that threatened to overwhelm the public health and healthcare infrastructure, the local PHCs--as regional outposts within the auspices of the Ministry of Health, Labor and Welfare--took the lead in making dynamic adaptations to meet the needs of the pandemic, including but not limited to allocating patients across a wider network of designated and non-designated hospitals. Japan's narrative highlights the model of a regionalized public health system, which could be an advantage in infectious disease outbreaks like COVID-19 in which rapidly evolving caseload patterns demand nimble, locally-responsive, and coordinated pivots.
- **However, public health entities cannot become bottlenecks for critical decisions that need to be made on an individual basis and at scale, such as COVID-19 testing.** Though PHCs did serve a key triaging function, they also held onto tasks such as testing for COVID-19, which not only further stretched their capacity but also precluded rapid, widespread testing--potentially contributing to asymptomatic/presymptomatic spread of virus in the community. In deploying regionalized public health amidst a pandemic, redistribution of testing to a wider network of screening centers and laboratories and facilitation of in-house testing within individual hospitals are critical.
- **Robust investment in the regional public health sector is necessary for a sustainable pandemic response.** Insufficient investment in the public health sector--ranging from undervaluing of graduate-level public health education to staff shortages at each PHC--is a major barrier to the sustainability of Japan's model. In establishing a regionalized public health system, providing adequate financial and human resources will be critical for skilled personnel to fulfill the roles of triage, local health system coordination, contact tracing and beyond.
- **Active sharing of physical resources, intellectual capital, expertise, and data are foundational to an effective collective health system response.** Japan struggled with asymmetric resource allocation, in which some non-designated hospitals lacked the resources (e.g., negative pressure rooms) and infection control expertise to safely treat COVID-19 patients while some designated hospitals lacked intensive care experts who were at non-designated facilities. Active dissemination of data and protocols, as well as creative avenues for collaboration such as tele-consulting, will be important to uniting any public health network against large, unpredictable crises. Furthermore, transparent sharing of information with the public would enhance a collective population-level response with increased accountability.

# Appendix

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**Supplementary Table 1.** Thematic analysis of interviews.

## Japanese healthcare system

### Public health center (PHC) involvement in patient triage

*Distribution of comments*

	Tokyo	Other
Designated Hospital	1/3	0/2
Non-Designated Hospital	2/2	1/5
Public Health Center	N/A	1/1

*Direct experiences and quotes*

*Interview 7: D/Tokyo (S)*

“For outpatient measures, there are three routes patients are admitted. The first is through a referral or introduction through the public health center. The second is through requests from a neighborhood practice, such as in cruise ship passengers and cluster cases. The other route is walk-ins.”

*Interview 9: ND/Tokyo (O)*

Interviewee stated that the triage system was established as early as January and February, initially to accommodate patients with travel history to Wuhan, with only a subset of patients triaged to hospitalization

*Interview 2: ND/Other (U)*

Interviewee reported that his institution primarily receives patients who have been referred by local PHC.

*Interview 10: PHC/Other (H)*

“[If they have concern for COVID-19] Patients have two options: to call the call center at the PHC or they end up walking into a hospital or clinic. They would never directly go to the designated COVID-19 clinic, as it is not disclosed to the public which hospitals house these special clinics and all of the referrals are done by the PHC. If a local clinic provider suspects COVID-19 [in a patient], a call comes into the PHC, and we direct them on which COVID-19 clinic to send them to.”

*Interview 11: ND/Tokyo (I)*

“Patients can be referred in from PHC, and we also reported possible COVID patients to PHC for testing. If PHC says to transfer, we then transferred possible COVID patients to designated hospitals.”

### Public health center (PHC) involvement in HCW protection

	Tokyo	Other
Designated Hospital	0/3	0/2

*Interview 2: ND/Other (U)*

(In response to question about how eligibility to return to work is determined for exposed HCWs): “In the case of a close contact exposure, our regional/affiliated PHC will actually be the one to manage these cases. In general, after their 2 weeks of quarantine and/or monitoring, if they do not have

Non-Designated Hospital	0/2	3/5
Public Health Center	N/A	1/1

any symptoms, they are okay to come back... although the ultimate decisions on the length of time off... such as whether we give them extra time [beyond 2 weeks] off from work... falls on the individual hospital.”

“The weight of the opinions of the PHC is very strong. They typically don’t mobilize until [the case is confirmed for] a positive COVID-19 status... but once it is positive, they give us a lot of orders/recommendations.”

*Interview 5: ND/Other (K)*

Interviewee stated that, if nf exposed HCW became sick enough to require hospitalization his return to work would depend on approval by the PHC.

*Interview 8: ND/Other (O)*

Interviewee stated that, as part of healthcare worker exposure prevention and management, healthcare workers with a history of fever longer than 4 days are required to report to the PHC.

*Interview 10: PHC/Other (H)*

“In terms of how we’ve been involved when a healthcare worker gets exposed... we investigate the exposure circumstances, determine need for testing, and order home quarantine if needed. Just recently, we ordered home quarantine for 9 emergency medical technicians. We also advise hospitals [on this matter].”

## Public health center (PHC) involvement in testing

	Tokyo	Other
Designated Hospital	2/3	1/2
Non-Designated Hospital	2/2	4/5
Public Health Center	N/A	1

*Interview 6: D/Tokyo (M)*

Interviewee stated that, while they have now developed in-house PCR testing capacity, their institution initially relied on PHCs for all of their diagnostic testing.

*Interview 4: D/Other (Y)*

Interviewee states that the general process in Japan is for the hospital to contact PHC with any requests for PCR testing, for the PHC personnel to physically come to the hospital to retrieve the sample, and for them to conduct testing and provide results.

*Interview 7: D/Tokyo (S):*

Interviewee stated that PCR testing is unavailable in-house at their institution and largely rely on the PHC.

*Interview 1: ND/Other (D)*

Interviewee stated that PCR testing cannot be done in the hospital and is done by the PHCs, but the maximum that PHCs can accommodate is roughly 50 per day.



*Interview 2: ND/Other (U):*

When asked about who among exposed HCWs gets access to testing: “We [physicians] can give our preferences [for the tests we want to get done], but the final decision is made by the PHC. The PHC seems to be considering things like their testing capacity in deciding who can get testing.”

When asked about the turnaround time for testing: “It also seems like they are assigning prioritization statuses [to certain tests] here as well... if it is an important test for a ‘dangerous’ case, it has come back as early as half a day, but for other cases it can range from 24 hours to a day and a half. It seems like they are also prioritizing the testing for cases that might evolve into a larger cluster.”

*Interview 8: ND/Other (O)*

Interviewee stated that, while they are considering rolling out in-house PCR, they previously relied completely on PHC.

*Interview 5: ND/Other (K)*

Interviewee stated that their institution’s testing is completely outsourced to the PHC.

*Interview 9: ND/Tokyo (O)*

Interviewee stated that, for an exposed healthcare worker seeking testing, their two options would be through the dedicated COVID-19 clinic or through the PHC -- while their institution has in-house testing capacity, this is limited.

*Interview 10: PHC/Other (H)*

Interviewee stated that there are generally two possible tracks for PCR testing -- governmental testing performed through the PHC and non-governmental testing amenable to health insurance coverage (done by alternative testing sites or by hospitals themselves).

*Interview 11: ND/Tokyo (I)*

“PCR testing is done in-house and also at PHC. This seems redundant.”

## Unique Japanese adaptations

### Healthcare system structure

	Tokyo	Other
Designated Hospital	1/3	0/2

*Interview 10: PHC/Other (H)*

“First off, without the presence of PHCs, this management [by Japan] would not be possible... having one CDC is powerless, and the greatest strength lies in organizations with consistent human resources who are close to the community and can deal with issues in their immediate vicinity.”

Non-Designated Hospital	1/2	0/5
Public Health Center	N/A	1/1

“Another strength comes from universal health insurance (国民皆保険制度), which secures accessibility to healthcare. For example, doesn’t Japan have a relatively higher proportion of diabetic patients who have their disease under control? When there is medical intervention [at baseline], healthcare facilities will be notified of major changes in health status, indirectly improving outcomes even if patients get sick with an infectious disease.”

“Because there are multiple systems in place for regular “health checks,” there are fewer “abandoned diseases” (undiagnosed/unmanaged comorbidities) than other countries. . . I believe there are large effects in maintaining baseline health and increasing [Japanese citizens’] awareness [of their health].”

*Interview 6: D/Tokyo (M)*

Interviewee noted that Japan’s relatively high bed capacity (13.1 per 1000 people in Japan, compared to 2.8 in the U.S.), although this is countered by a relative shortage of physicians.

*Interview 13: D/Chiba (F)*

“Designated hospitals are not designed to handle a surge of patients who may require negative pressure rooms or ventilators. They are simply designated to isolate these patients. Therefore, as the patient numbers increased in late March, we could not accommodate these patients, and they had to be accepted at non-designated hospitals around us.”

## Harnessing of prior infectious disease experience

	Tokyo	Other
Designated Hospital	2/3	0/2
Non-Designated Hospital	0/2	2/5
Public Health Center	N/A	0/1

*Interview 6: D/Tokyo (M)*

“As an institution, we have a mission to be leaders in infection control and prevention, so we have rigorous standard protocols. During the MERS outbreak in South Korea, cases were overflowing, and there were many patients being admitted. We had to prepare how to receive, hospitalize and treat them. Since then we have continuously been building on how we can commit to the work of influenza and MERS. There have not been any new pathways [to separate patients by COVID risk] or new systems put in place. We can use our previous hospital standards and we modify as we learn about effective control measures for COVID-19.”

[Interviewer: How many healthcare workers were known to be infected within the hospital?]

“There are zero infections. It’s a point of pride for our institution.”

[Interviewer: How about in your region?]

“However, there are a large number of infections in our region.”

*Interview 6:D/Tokyo (M)*

Interviewee described how his institution responded by transferring all of its TB patients to an alternative hospital in late February, converting all of its TB beds into a dedicated COVID-19 ward, with all decisions surrounding use of the negative pressure rooms managed by a pulmonary care provider with extensive experience in the care of TB patients.

### *Interview 3: D/Tokyo (H)*

Interviewee described how his hospital converted its TB unit into a dedicated COVID-19 ward by transferring 10 TB patients to another facility, preserving the same TB unit care team members, who were accustomed to and experienced in strict isolation protocols

### *Interview 3: D/Tokyo (H):*

“Our hospital was not assigned at the time. However back on February 15, middle of February, we had been seeing community spread of COVID patients and we actually first encountered community acquired COVID patients on February 15. At the time we had been preparing for patients from the cruise ship and evacuations from Wuhan, China. So for hospital infection prevention we were well prepared before the epidemic started. On February 15 we saw the first case of community acquired cases, we had been taking care of patients from the community and also some patients were transferred from downtown Tokyo because they may not be able to take care of patients because of, I figure, inadequate infection prevention strategies at these hospitals.

“So what we did actually in the emergency department we strictly separated patients with respiratory symptoms so they have a different entrance. If a patient has no respiratory symptoms, they can go in from the usual entrance. We do have negative pressure rooms in the emergency department, two negative pressure rooms, so these patients are directly going to these negative pressure rooms. For doctors of the emergency department or critical care physicians who have to take care of these patients they have to wear protection including N95 masks, PPE, and eyeshield prior to entering the room. So that’s what happened at the beginning. Fortunately we do have a tuberculosis care unit for patients with tuberculosis. At the time we have up to 10 patients with tuberculosis. We eliminate patients and asked other hospitals to care for them. Then we opened the tuberculosis care unit exclusively for patients with COVID-19 and patients with pneumonia. In the emergency department, if the patient was diagnosed with pneumonia, we also got COVID-19 test result or test status. All patients with pneumonia are supposed to go to the tuberculosis care unit in meantime. Which in, of course, each room has negative pressure and the whole entire unit has negative pressure as well.”

### *Interview 3: D/Tokyo (H):*

“We actually educated all healthcare providers who are going to see these patients. We did a drill of how to don and doff PPE for all healthcare workers. The PPE doffing process is really problematic. That’s why with every single PPE item when they’re doffed, we actually perform hand hygiene.

“For example, we are going to get rid of our gloves, then hand hygiene. Then after that, we’re going to take off the eyeshields, and hand hygiene again. Then also take off the gown, and then hand hygiene. Take off the N95 mask, then get out the room. We strongly implemented hand hygiene every time they doff items. [...] Every negative pressure room had posters how to doff the PPE.”

“Tuberculosis care unit nurses caring for patients for tuberculosis were already taking care of patients with tuberculosis, wearing N95 masks, as they were from the start concerned about tuberculosis infection and therefore taking great care in protecting themselves. So to add a surgical mask on top of the N95 wasn’t a big deal since it was just seen as strengthening protection. There wasn’t a sense that the PPE protocols for COVID-19 were cumbersome. [...] The treatment team are only assigned for pulmonary medicine and general medicine as primary attending.

[Interviewer: So people who are already familiar with these pathologies and types of patients?] “Yes, that’s correct. We got ID consent/conflict from them as well. Critical care unit have to take care of patients with severe conditions. [...] we actually opened one unit with negative pressure rooms for COVID-19 patients but it has not been used until recently.”

### *Interview 1: ND/Other (D)*

Interviewee emphasized that his institution had inadvertent preparation for community spread infections through taking on the care of passengers of the Diamond Princess cruise ship.

### *Interview 8: ND/Other (O)*

Interviewee attributed their preparation to their longstanding experience with TB management, including their experience with swiftly transferring patients into negative pressure rooms

## Infection control strategies

	Tokyo	Other
Designated Hospital	2/3	1/2
Non-Designated Hospital	1/2	2/5
Public Health Center	N/A	0/1

### *Interview 6: D/Tokyo (M)*

Interviewee stated that he (an infectious disease expert and director of his hospital's infection control team) and a nurse certified in infection control provide PPE training to all healthcare workers. He and his team have also implemented pre-determined days for healthcare workers to "peer-review" each others' PPE docking/doffing process to ensure compliance and safety.

### *Interview 3: D/Tokyo (H)*

Interviewee reported that they and other members of the infectious disease team were heavily involvement in the training of PPE use among HCWs, doubling as an infection control team and performing daily "rounds" on the frontline COVID-19 areas of the possible to observe and ensure safe PPE use.

### *Interview 2: ND/Other (U)*

Interviewee reported that his institution has incorporated a variety of COVID-19 resources into their EHR system, including a compilation of video educational material for proper PPE donning and doffing procedures, with oversight by respective division chief to ensure viewing by individual healthcare workers.

### *Interview 5: ND/Other (K)*

Interviewee described that, in his hospital, examination of patients suspected of COVID-19 is done only in pre-specified areas of the emergency department and conducted only by those who have undergone formal training in PPE docking/doffing.

### *Interview 11: ND/Tokyo (I)*

Emergency physician Interviewee described that the infection control strategies were not well established initially for patients who were being transferred to the ED via EMS - use of partial PPE was common until the clinician realized that a patient's complaint may be secondary to COVID-19. At that point, full PPE was endorsed, and the patient would be transferred to designated hospitals. Nowadays, we are accepting patients for suspected COVID in 4 neg pressured rooms with full PPE in our hospital. For patients who walked into the ED, "febrile clinic" was established and created a physically separate pathway for these patients to be evaluated, isolating from EMS and other non-febrile patient traffic.

*Interview 13: D/Chiba (F):*

"We leave equipment in the negative pressure triage room in the ED so patients can check their own vitals to minimize the contact with healthcare workers."

## Unique measures for HCW protection

	Tokyo	Other
Designated Hospital	3/3	0/2
Non-Designated Hospital	0/2	3/5
Public Health Center	N/A	1

*Interview 6: D/Tokyo (M)*

Interviewee stated that his hospital has been repurposing the hospital dormitories as quarantine units for exposed healthcare workers with family members (and thus cannot effectively self-isolate at home).

Healthcare workers under quarantine must fill out a symptom self-monitoring sheet twice a day, which must be submitted to the hospital's internal infection control team at the end of the quarantine period.

*Interview 3: D/Tokyo (H)*

"We actually assigned all healthcare workers who have taken care of patients with confirmed case of COVID-19, then they have to--we actually provide a QR code, which is directly connected to Google Form. They have a questionnaire and a daily checking of temperature. They have to report it through the website, through the QR code for 14 days. Once they started symptoms like at-risk symptoms or low grade fever, because ID physicians are checking these QR code information every day, Google Form information every day, we pick up healthcare workers with symptoms, then we directly contact these healthcare workers to decide whether these healthcare workers need COVID-19 PCR test. [...] It depends on situation. If it is just cold symptoms, no fevers, we may accept healthcare workers for work, to continue to work. This is based on talking with them based on severity of symptoms. But we actually decide. Then there's no certain criteria or protocol for who should get taken, take sick leave."

*Interview 7: D/Tokyo (S)*

Interviewee stated that the healthcare workers at her institution are required to self-monitor symptoms for the triad of fever, cold-like symptoms and respiratory symptoms. They must report their symptoms to their supervisor, who reports to occupational health.

To protect healthcare workers in the evaluation of walk-in patients, their institution has implemented a 3-phase screening process, with progressive increase in PPE use with each step -- mandatory use of a surgical mask at the reception desk with on-the-spot symptom screening, temperature check and evaluation of O2 saturation (with 95% as a cut-off), use of mask and gloves once patients are relocated to a designated area for an exam, and more extensive PPE used by the pulmonary care/specialist examination of suspect patients.

*Interview 2: ND/Other (U):*

"As early as early March, we had daily symptom checks instituted for all workers... in each department/division, a supervising person would perform a contact-free temperature check for all persons [working in that department that day]--though for those who already measured their temperature at home, it would be self-reported. We also had the workers state any subjective symptoms. Recently we've been in a dangerous state with the numbers of masks

available, so we developed a model where HCWs would receive their surgical mask in exchange for providing this health information... kind of like a ticket on a phone app that would determine whether you can get in or not.”

*Interview 1: ND/Other (D)*

Interviewee stated that, as part of self-monitoring, all healthcare workers are required to take a daily temperature, and supervisors must report those with a fever.

*Interview 5: ND/Other (K)*

Interviewee stated that their hospital released an official internal “code of conduct” to reinforce social distancing measures among healthcare workers and protect them against exposure and infection

## Current challenges

### Community measures to curb spread

	Tokyo	Other
Designated Hospital	3/3	1/2
Non-Designated Hospital	1/2	3/5
Public Health Center	N/A	1

*Interview 6: D/Tokyo (M)*

Interviewee expressed that effective social distancing is limited when a government has no true prohibitory/enforcement power. He himself has observed large clusters of infections emerging in the urban areas within Tokyo (i.e. Roppongi, Kabuki-cho), where social distancing is particularly lax and many restaurants and shops are still in business.

He generally feels that the Japanese public is overly optimistic surrounding the reality and prospect of the pandemic, whereas healthcare workers are apprehensive about the rising caseload.

*Interview 3: D/Tokyo (H)*

Interviewee states that Tokyo is now becoming the epicenter of the pandemic and expects it to face a similar situation seen in areas such as New York and other cities of Europe. He notices increased mobility of people -- likely with contribution from Japanese residents traveling back from the U.S. and other countries in bulk.

*Interview 7: D/Tokyo (S):*

“I’m not seeing the effects of social distancing on the clinical frontlines. Even as cases were increasing on the one hand, an ‘overshoot’ of cases wasn’t imminent. It may be that current patients who have COVID relaxed their social distancing during a recent three-day holiday after seeing that was the case. One to two weeks before, we had a consecutive three-day holiday with Friday, Saturday, Sunday off. Around then, school closures that had begun without reason were ending without reason. Experts were also reporting that the high prevalence of cases in Hokkaido were subsiding. The public may have taken this to mean it’s fine now, and within a month people were relaxing social distancing. There were probably many people in that time who may have become infected.

“Combining current clusters at hospitals, the cluster of cases in China, and residents returning to the country, there hasn’t been a steep increase, but undoubtedly cases increased as was predicted, and it may continue to follow in this trend.”

*Interview 4: D/Other (Y):*

Interviewee states that, despite the nationwide recommendations for social distancing, she is still observing numerous people out and about at night.

*Interview 8: ND/Other (O):*

When asked about the governmental involvement in the enforcement of social distancing: “My honest opinion is that the governmental involvement in social distancing efforts is ‘amai’ (inadequate). My impression is that there is some outreach encouraging social distancing at the local community level. . . Social distancing here is still at about 40-50%. Disappointingly, I still see businesses open and active at night in cities like Osaka.”

*Interview 9: ND/Tokyo (O):*

When asked about the weaknesses of Japan’s approach thus far: “I think the cause is multifactorial, but as a general phenomenon, I think the leadership has been weak. Whether at the national, local regional or institutional level, generally speaking, the leadership has been weak. The larger the hospital is, the less able they are able to make dramatic, dynamic changes [to their approach].”

“It’s been two months -- and from the beginning, those in the infectious disease specialty -- especially those in the designated hospitals who have been seeing this from the early stages -- have been cautioning [about the pandemic]. However, with the designated hospitals seeing the cases, many of the non-designated hospitals went for 2 months without cases coming to their door. [In addition to this,] Cases that scattered into the community after the cruise ship, people coming back to Japan from European countries, relaxation of social distancing, increased mobility of people with the start of the [academic] new year--I think all of these ‘waves’ synchronized for us to produce this situation.”

*Interview 2: ND/Other (U)*

Interviewee emphasizes that, unlike other countries, social distancing is completely voluntary, with no strict enforcement power at the governmental level. In this setting, he has observed increased mobility of people (and breakdown of social distancing), particularly in the Tokyo area and in the weekend preceding this interview (late March).

*Interview 5: ND/Other (K)*

Interviewee observed dramatic increase in population mobility and breakdown of social distancing during the three-day weekend in late March.

They infer that this laxity in social distancing (i.e. continuation of large events, shops and businesses) is likely due to two overlapping factors -- a mix of anxiety and apprehension toward the looming economic losses from the shutdown of businesses (with no clear solutions from the government for economic support), as well as an optimism among citizens regarding the number of cases being “not as bad as we thought.”

## PPE shortage

	Tokyo	Other
Designated Hospital	3/3	1/2
Non-Designated Hospital	2/2	3/5
Public Health Center	N/A	0/1

*Interview 6, 3, 1, 8, 9: D/Tokyo (M), D/Tokyo (H), ND/Other (D), ND/Other (O), ND/Tokyo (O)*

These interviewees affirmed that there was a felt shortage of PPE at their institution.

*Interview 7: D/Tokyo (S)*

“We must accept all COVID patients at our institution, and because we are being cautious [about becoming infected or infecting others], currently we have run out of surgical masks and face shields. Our supplies are being used exhaustively. Our hospital(s) aren’t receiving surgical masks. Here we are stretching one week’s supply to two weeks. We are taking supplies in small quantities from different places. [Our hospital] is extending as much as possible the lifespan of precious supplies that are in limited supply.”

*Interview 11: ND/Tokyo (I)*

“PPE is in low supply. We used the same N95 mask for a while, cleaning it with alcohol wipes. We got one surgical mask for the day. Now (May) the supply is getting better. This challenge remains even for now and worried about what would happen going forward”

*Interview 12: ND/Chiba (S)*

“I’ve been using the same N95 mask for weeks now. I clean it with alcohol but learned recently now that this compromises the integrity of the mask. I’m worried about that.”

*Interview 13: D/Chiba (F):*

“We have been sanitizing our N95 masks because of lack of supply.”

## Resource allocation and healthcare system capacity

	Tokyo	Other
Designated Hospital	2/3	2/2
Non-Designated Hospital	1/2	1/5
Public Health Center	N/A	1/1

*Interview 6: D/Tokyo (M)*

“We have rooms, we have machines. There isn’t a shortage of ventilators. Compared to other countries, we have more bed capacity in our hospitals. [...] What we lack the most is people. Then education and training. What we really have a shortage of are specialists. We do not have enough intensivists. We lack the ability to coordinate the distribution of vital resources to places that need them. For example, there are many ECMO specialists at Hospital A, but if the head of the infectious diseases at Hospital A is hesitant to take on COVID patients then these specialists cannot commence care for COVID patients. The specialists cannot go to where the COVID patients are. Doctors who are presently caring for COVID patients will have only their knowledge and skillset to draw from, and those doctors who have specialized knowledge in ECMO cannot make their skills of use there.”

*Interview 6: D/Tokyo (M)*

Interviewee stated that, while Japan has relatively higher bed capacity than global counterparts, this is hampered by a shortage of physicians (2.4 per 1000 people in Japan, compared to 4.0 in Italy, 4.3 in Germany, etc).



### *D/Tokyo (S)*

Interviewee commented on the dissonance seen among departments/stakeholders within same hospitals in terms of taking COVID patients--for example, some hospitals were showing reluctance citing what they felt were "minor" barriers such as not having separate entrances for suspected patients or not having negative pressure rooms. They argued that these hospitals should be able to adapt within their capacity to mitigate risks enough to adequately take on COVID-19 care.

They stated that, due to mandatory hospitalization of COVID-confirmed patients for 2 weeks regardless of symptoms, there is essentially unlimited entry into the existing healthcare system with a bottleneck at the exit.

"It's on the hokenjo to frantically find a place that can hospitalize their patient. Even for hokenjo that don't have the personnel and resources, the smallest hokenjo have to secure a patient's hospitalization.

"Even so, while understanding the pressure on the hokenjo, there aren't places that are proactively cooperating with the hokenjo to triage patients. It's as if they're letting the hokenjo keep doggedly knocking on their doors. Since patients have to be hospitalized regardless of symptoms, everyone is let in and given a PCR test. Then to leave they need to have cleared two PCR tests. Staff at some hospitals believe that clearing the two tests could result in monthlong hospitalizations. Patients would keep coming in, but not leave. Their numbers would overwhelm the hospital system and hospitals would have to promptly open new areas to be able to intake patients. Both of these ways to find a hospital bed for every person have to be addressed, or I believe that at one of these points we'll reach a limitation."

### *Interview 4: D/Other (Y)*

Interviewee expressed worry and apprehension toward the nation's policy toward mandatory 2-week hospitalization of COVID-confirmed patients and whether this diminishes the healthcare capacity to take on more severe, critical cases as they arrive.

### *Interview 10: PHC/Other (H)*

"[A major challenge is] the shortage of governmental personnel. There is an overwhelming shortage of manpower. If someone at the PHC gets sick, we cannot continue this current strategy of management... and none of our tasks are amenable to teleworking."

### *Interview 11: ND/Tokyo (I)*

"Since we only have 4 negative pressure rooms in our hospital, even after we are asked to accept COVID patients given the overflow of patients at designated hospitals, we are unable to accept such patients beyond our capacity. This led to delay in hospital transfer by the EMS (can't find accepting hospitals), which is an existing societal problem in Japan. If we need to accept more patients but we cannot. - However, as of the beginning of May, we have only had 1 critically-ill COVID patient in our hospital, which is already abnormal given that we are not a designated hospital. We are the #1 accepting hospital for critical ED in Tokyo."

### *Interview 11: ND/Tokyo (I)*

"I'm worried about not having isolated routes for patient transport within the hospital and walled rooms in the entire hospital. I don't think we are able to care for COVID patients safely- hospitals like ours should have more capacity to handle infectious disease patients like COVID."

*Interview 12: ND/Chiba (S):*

"We are not accepting any patients with possible or suspected COVID - this is quite unusual because we never decline EMS transport in our hospital. Therefore, our ED patient volume is quite low now. We don't have a surge of patients in our hospital at all. Patients also are supposed to call before they walk into the ED - these patients don't come anymore because we ask them not to come"

*Interview 12: ND/Chiba (S):*

The interviewee also expressed his decrease in salary during the pandemic. He receives much of his monthly income through part-time, non-academic institution work ("baito") at small hospitals. After the closure of all such small hospitals, he lost half of his monthly income. The salary provided by the main academic institution is "only a fraction" of his monthly income.

*Interview 13: D/Chiba (F)*

"We are all tired of caring for patients with COVID. Because of prolonged COVID duration, small hospitals are closing or not accepting possible/suspected COVID patients - therefore, we will have to see more of these patients but we don't have enough capacity to meet the demand. Ambulances cannot find an accepting hospital, which seems to be exacerbated by the current COVID crisis. Therefore, the hospitals that are working hard to accept these patients are getting financially more difficult to maintain (not enough reimbursement for caring for these patients, in the setting that normal profitable operations are halted). The government has no authority to require hospitals to accept patients. Hospitals can't accept patients because they have no capacity. So I'm worried that if a surge of patients occur like it did in the U.S., we won't be able to care for them."

## PCR testing as a bottleneck

	Tokyo	Other
Designated Hospital	0/3	0/2
Non-Designated Hospital	0/2	2/5
Public Health Center	N/A	0/1

*Interview 2: ND/Other (U):*

When asked about who among exposed HCWs gets access to testing: "We [physicians] can give our preferences [for the tests we want to get done], but the final decision is made by the PHC. The PHC seems to be considering things like their testing capacity in deciding who can get testing."

*Interview 1: ND/Other (D)*

Interviewee stated that bottlenecks within the existing national COVID-19 response were occurring at multiple levels, including PCR testing capacity.

## Challenges unique to non-designated hospitals

	Tokyo	Other
Designated Hospital	1/3	0/2
Non-Designated Hospital	2/2	3/5
Public Health Center	N/A	1/1

### *Interview 3: D/Tokyo (H)*

Interviewee stated that while their institution has been able to effectively expand their capacity by repurposing their TB unit, they suspect that their counterparts in the Tokyo metropolitan area may not have the bed capacity to take on COVID-19 patients when the need arose.

### *Interview 9: ND/Tokyo (O)*

When asked about how his institution was preventing infections within the hospital: "Initially, we were trying to not let [COVID-19 cases] in, we were trying to not even see them... there are different types of hospitals when it comes to COVID-19 care. There are designated hospitals at the center, and these are required by law to take in COVID-19 patients, right from the beginning. We have other local public/community hospitals on an outer ring. Even further outside are the specialized high-level care facilities--I think there are maybe 10, or 20, in Tokyo--these don't do infectious disease care, and in our case, we do transplant [surgery]. For these hospitals, the general stance is that we don't want to see COVID-19 patients, as it immensely reduces our capacity [for other care]. COVID-19 care is something our institution is not used to seeing, yet will require large resources that limit other forms of care [that we provide specially], endangering our ability to run the hospital... however, the situation is changing, pressuring us to a point where we have no other option other than take in patients. In order to contain the infection within our own hospital, we initially made 2 'designated' COVID-19 beds. Until recently, our plan was to take in 2 patients in the ICU. However, within the past 2 days, the situation in Tokyo has become more severe, and we have received several briefings and orders from the municipal government for the various concentric rings [of hospitals] to secure certain numbers of beds according to the stage of the pandemic. As of yesterday, we have secured 6 beds in the ICU and one general inpatient floor -- so we are prepared to take in 6 severe cases and approximately 20 moderate cases."

### *Interview 2: ND/Other (U)*

Interviewee stated that their institution is likely not equipped to be a frontline care site for large numbers of COVID patients, and is unsure whether they even have the preparedness/resources for patients that would require non-invasive positive pressure ventilation (CPAP, BiPAP) and more aggressive interventions.

### *Interview 5: ND/Other (K)*

Interviewee states that his non-designated hospital has been scrambling to ramp up its gears and get infection control practices in place following the report of the first case of community spread in his prefecture in late March.

Given that they are not a designated hospital, all confirmed cases must go to a separate designated hospital in the vicinity, which itself only has four negative pressure rooms. Interviewee states that non-COVID-19 patients from this designated hospital who may need critical care may have to be transferred to interviewee's hospital to sustain capacity at both institutions.

### *Interview 10: PHC/Other (H)*

"The reality is that many community hospitals can reject all febrile patients, and this is allowed. Due to this, there are patients who are now unable to be seen by their regular physicians for their regular conditions... We aren't at the place where complete [nation-level] control of all healthcare institutions is possible."

*Interview 11: ND/Tokyo (I)*

"I think it is dangerous to care for COVID patients in non-designated hospitals because staff is not accustomed to PPE - that's why we have had cluster outbreaks in hospitals in Japan."

*Interview 12: ND/Chiba (S)*

"We should not see COVID patients in non-designated hospitals because we would quickly go bankrupt if we do. Many hospitals are forced to shut down (by the government) when hospital staff outbreak occurs. Therefore, we cannot and should not see COVID patients in our hospital. Designated hospitals get additional funding to care for these patients - we do not, so we cannot risk going bankrupt by seeing these patients."

*Interview 12: ND/Chiba (S):*

"Income for academic physicians is a major problem now that small clinics/hospitals are closed. We usually have part-time hospital work at outside clinics to supplement our income. This is all gone because all small clinics and hospitals are closed. Therefore, my income is cut in half. My own hospital's salary is unchanged, but overall income is quite low now."

## Ethical challenges

	Tokyo	Other
Designated Hospital	1/3	0/2
Non-Designated Hospital	0/2	1/5
Public Health Center	N/A	0/1

*Interview 6: D/Tokyo (M)*

"The actual count of machines that we are at risk of facing shortages are not ventilators but the number of dialysis and ECMO machines... There are two machines that could be used simultaneously for COVID patients. As soon as that were to happen, we would be in immediate need of ECMO. We have a huge and apparent problem looming with how to ethically select which patient can receive ECMO, and to know which indicators qualify one patient for ECMO [over another patient].

[Interviewer: Are there policies that have been introduced or you're considering to make these decisions?]

"In Japan, for patients 75-years and older, there is a policy that ECMO will not be used. Gradually the age limit has changed to 70-years-old, and even further now to limiting use of ECMO on patients up to 65-years-old."

*Interview 12: ND/Chiba (S)*

"With no support from the government and clinical uncertainty with not enough PPE, we feel that we can only do our best. We think often about elderly patients getting critically ill from COVID - jumping in there to intubate with minimal PPE seems unrealistic. Putting young healthcare workers at risk like this when you think about the remaining longevity of such patients does not make sense societally. If one of us gets infected by trying to save an elderly person, that is a risk that we cannot take."

**Supplementary Table 2.** Demographics of Interviewees (*Infectious Disease Designated Hospitals*)

Interviewee	Interview 6	Interview 4	Interview 3	Interview 7	Interview 13
<b>Positions</b>	Department of Infectious Disease, Department of Medical Education	Professor of infectious disease	Director of division of infectious diseases, director of infection response team, consultant role in inpatient COVID-19 care	Nurse practitioner involved in infection control coordination	Emergency physician
<b>Region</b>	Tokyo prefecture	Chiba prefecture	Tokyo prefecture	Tokyo prefecture	Chiba prefecture
<b>Designation status</b>	Specialized	Type 1	Type 2	Type 2	Type 2
<b>Hospital Setting</b>	Government-run hospital, tertiary care center	Recently opened (March 16 2020) private tertiary care center	Public hospital operated by Tokyo metropolitan government	Private hospital	Operated by Japan Association for Development of Community Medicine
<b>Capacity</b>					
Total Beds	760	642 (320 opened at time of initial interview)	790	520	unclear
ICU capacity	10	unclear	40	~24	unclear
NPR	42 (40 - for TB, 2 others in pulmonary care unit + ICU)	unclear	unclear *50 TB beds cleared for COVID-19 care		unclear
<b>In-house PCR testing capacity</b>	Yes	Yes	Not asked in interview	No	No

**Supplementary Table 3.** Demographics of Interviewees (*Non-Designated Hospitals*)

Interviewee	Interview 9	Interview 8	Interview 1	Interview 2	Interview 5	Interview 11	Interview 12
<b>Positions</b>	Assistant professor	Infectious disease specialist, part of infection control team and also involved in the administrative aspects of testing	Infection Control officer for COVID-19	Primary care provider, member of COVID-19 infection control team, specializing largely on outpatient front	Director, department of palliative care	Assistant professor, emergency physician	Assistant professor, emergency physician
<b>Region</b>	Tokyo prefecture	Hyogo prefecture	Aichi prefecture	Aichi prefecture	Fukuoka prefecture	Tokyo prefecture	Chiba prefecture
<b>Hospital setting</b>	Independent, university-affiliated medical center	Public tertiary care center	Combined primary to tertiary care center	Community secondary care center	Private hospital	Independent, university-affiliated medical center	Independent, university-affiliated medical center
<b>Hospital capacity</b>							
Total Beds	1200	800-1000	1400	150	1048	1078	785
ICU capacity	40	15	not asked	per interviewee not functional	~15	~30	unclear
NPR	~30	24	not asked	~2	~2	<10	<4
<b>PCR testing capacity</b>	Yes	Previously no, considering starting in-house testing at time of interview	No	No	No	Yes (in-house testing and repeated at PHC for confirmation)	No