

# The impact of COVID-19 on the Japanese healthcare system and comparison of its mitigation measures with South Korea and Taiwan

Jung-ho Shin , Huei-Ru Lin , and Yuichi Imanaka 

Department of Healthcare Economics and Quality Management, Graduate School of Medicine, Kyoto University, Kyoto, Japan

Corresponding author: Yuichi Imanaka, Department of Healthcare Economics and Quality Management, Graduate School of Medicine, Kyoto University, Yoshida Konoe-cho, Sakyo-ku, Kyoto 606-8501, Japan. Tel: +81-75-753-4454; Fax: +81-75-753-4455; E-mail: [imanaka-y@umin.net](mailto:imanaka-y@umin.net)

## Abstract

Since the coronavirus disease 2019 (COVID-19) pandemic has begun, Asian countries/regions, such as Japan, South Korea, and Taiwan, had generally controlled the pandemic better than other countries. In this article, we showed the big impact of the pandemic on acute care hospitals in Japan, where the number of COVID-19 patients has been smaller than in other countries. We also compared the mitigation measures against the COVID-19 pandemic among Japan, South Korea, and Taiwan to study the factors affecting the differences among these relatively well-controlled countries/regions. We analyzed Diagnosis Procedure Combination data from the Quality Indicator/Improvement Project database, in which Japanese hospitals participated voluntarily. During the first declaration of emergency, which was from April 4 to May 25, the numbers of inpatients decreased roughly 20% for adults and 40% for those aged under 18 years compared to those of the same period in the previous year. In the analyses by disease, hospitalizations with acute coronary syndrome, ischemic stroke, cancer, childhood non-COVID-19 acute infections, infant and pediatric asthma decreased in number, whereas those with alcohol-related liver diseases and pancreatitis increased. Comparing selected mitigation measures against COVID-19, such as border control, enforced measures, information governance, and contact tracing, among Japan, South Korea, and Taiwan, the implementation and dissemination of measures were less strict, slower, and less comprehensive in Japan. This might explain why Japan has experienced a comparatively high incidence of COVID-19 and indicate a substantial risk of infection explosion. A change in behavioral compliance could trigger an infection explosion under poor performance in the response set. Further monitoring is warranted to promote the evolution of effective sets of countermeasures to overcome the pandemic.

**Key words:** COVID-19, SARS-CoV-2, healthcare system, hospitals, mitigation measures

## Key Messages

- Asian countries had generally controlled the pandemic better than other countries.
- Although the number of COVID-19 cases has been comparatively low in Japan, our studies show the impact is significant.
- Japanese measures were less strict, less prompt, and less comprehensive compared to those of South Korea and Taiwan, and heavily relied on people's self-restraint.

Since the first case of pneumonia caused by a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was reported in December 2019, the coronavirus disease 2019 (COVID-19) pandemic has not subsided. Prior to the availability of vaccines, Asian countries had generally controlled the pandemic better than other countries [1]. Understanding the impact of the COVID-19 pandemic on acute care hospitals in Japan, where the number of COVID-19 patients has been smaller than in other

countries, can be instructive. Further, we compared the mitigation measures and some features among three Asian countries/regions (Japan, South Korea, and Taiwan) to study the factors affecting the differences among these three relatively well-controlled countries/regions.

## The impact of the COVID-19 pandemic on acute care hospitals in Japan

Our study team conducted several studies to analyze the impact of the pandemic on acute care hospitals using Diagnosis Procedure Combination (DPC) data from the Quality Indicator/Improvement Project database, in which Japanese hospitals participated voluntarily [2–10]. Although the number of COVID-19 cases is comparatively low in Japan, our studies show that the impact is significant.

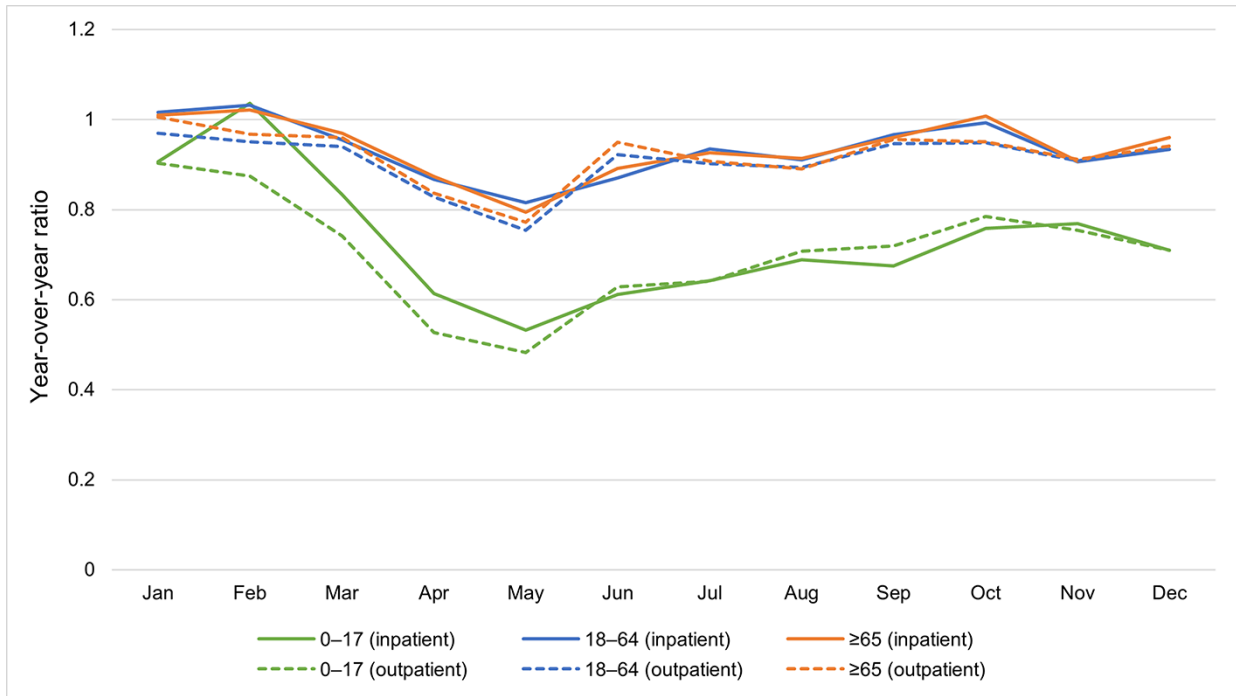
Figures 1–2 show the results of our recent analyses using DPC data of 206 hospitals until December 2020. The decreases in cases during the declaration of emergency (from April 4 to May 25, 2020) are roughly 20% for adults and 40% for those aged under 18 years compared to those in 2019 (Figure 1). From June 2020, the case volume has increased, but it still remains under the level of the

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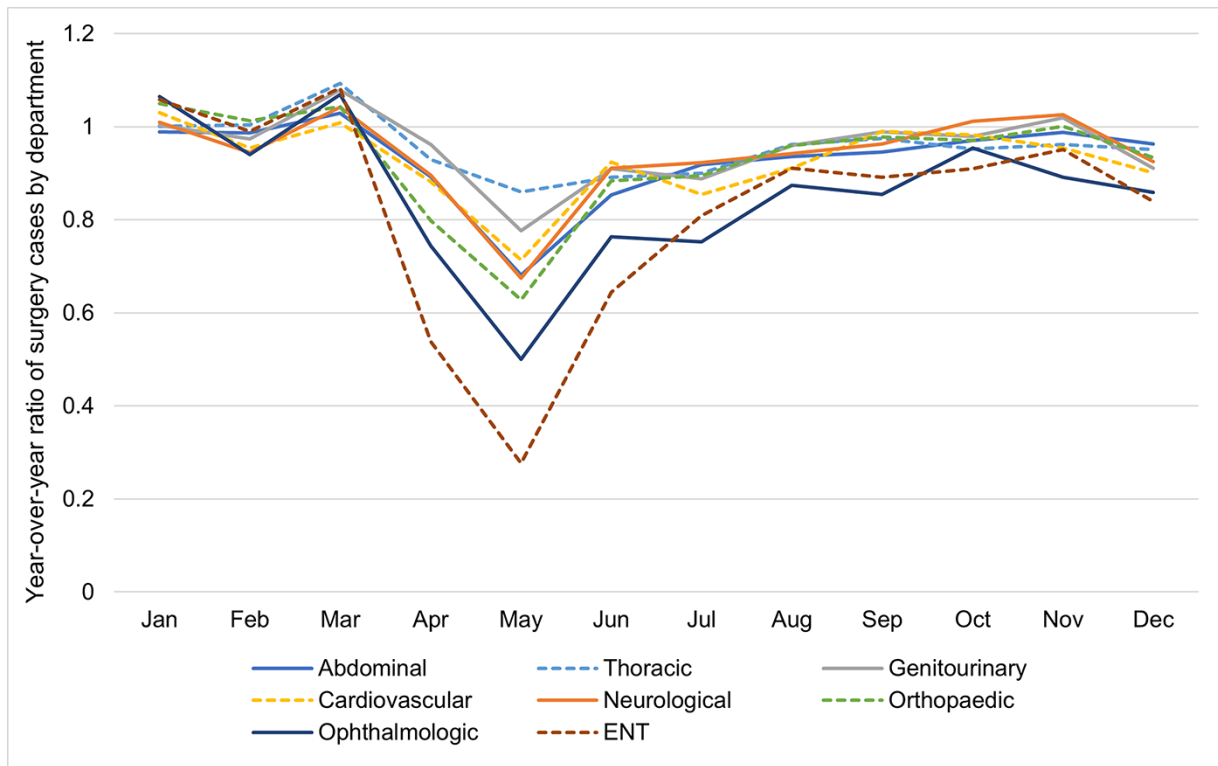
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**Figure 1** Year-over-year ratio of inpatient and outpatient cases by age groups. The number of hospitals is 206.



**Figure 2** Year-over-year ratio of surgery cases by departments. ENT, Ear, nose, and throat.

previous year (Figure 1). When looking into the volume of disease by disease, the number of inpatients decreased in various patient groups, such as acute coronary syndrome [5], childhood non-COVID-19 infections [6], transient ischemic attack and ischemic stroke [7], cancer [8], and infant and

pediatric asthma [9], with an exceptional increase in alcohol-related liver disease and pancreatitis [10].

On the other hand, evidence of impact on quality of care is awaited. One study showed that there were no changes in fibrinolytic therapy (process indicator) or in-hospital

mortality (outcome indicator) of acute coronary syndrome inpatients [5].

Figure 2 shows the year-over-year ratio of surgery cases by departments. The decreases in surgery cases of ear, nose, and throat and ophthalmologic departments during the declaration of emergency were as much as 70% and 50%, respectively.

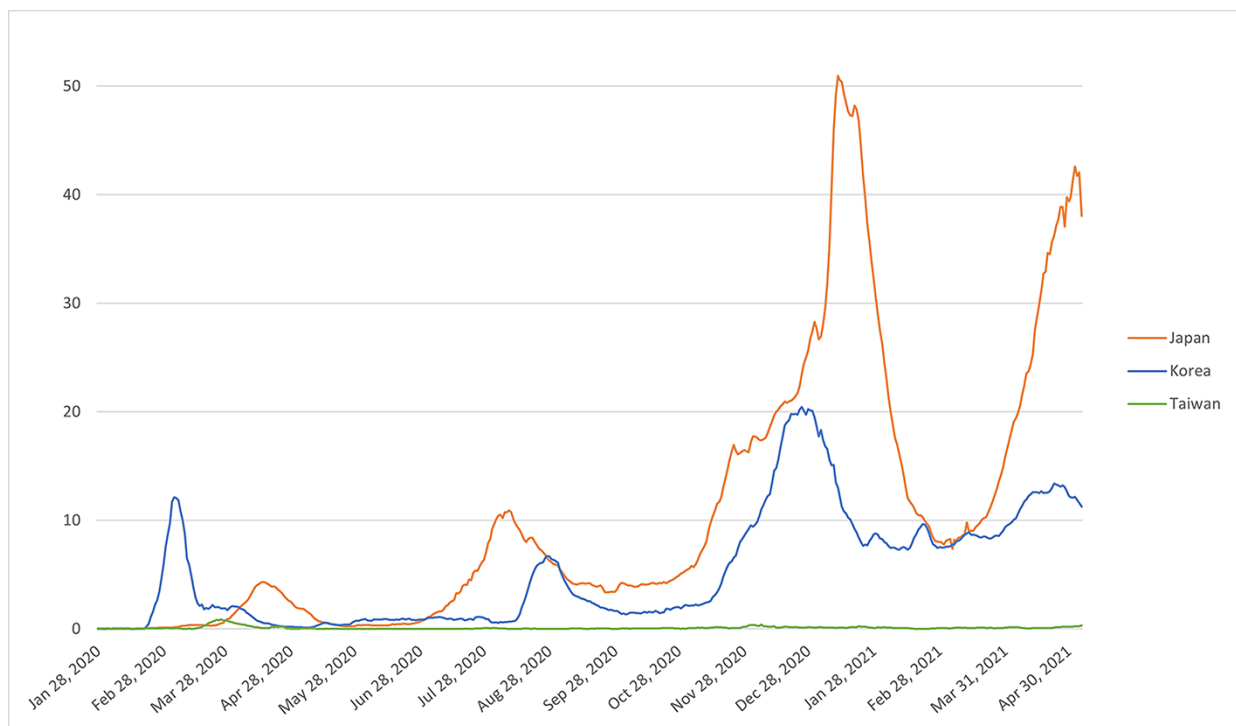
### Comparison of mitigation measures against the COVID-19 pandemic in Japan, South Korea, and Taiwan

Figure 3 presents daily new COVID-19 cases per capita of three Northeast Asian countries/regions, i.e. Japan, South Korea, and Taiwan. These Northeast Asian countries have controlled the pandemic better than many other countries. Some researchers tried to explain the performance of controlling the pandemic using the Global Health Security Index, which is the comprehensive assessment of health security and related capabilities [11]. However, they have found the Global Health Security Index could not explain the better performance of Asian countries [12, 13]. A study suggested that the differences in political and cultural aspects might be the reason [1] and another study reported that these countries have experienced SARS outbreak in 2003 and/or Middle East respiratory syndrome outbreak in 2015, and these experiences contributed to these countries' prompt and effective responses [14]. The reasons why some Asian countries/regions have coped with the pandemic better are not fully understood yet, but the comparisons of the mitigation measures against the COVID-19 pandemic among Japan, South Korea,

and Taiwan will give us insights into future responses to the ongoing pandemic.

We compared selected COVID-19 responses based on the framework suggested by the World Health Organization [15] and the European Centre for Disease Prevention and Control [16]. Among nine pillars (areas) of the framework, we picked six pillars and presented features within each pillar that we considered to be key differences among the three countries/regions (Table 1), using official references published by each Government [17–21]. To the above frameworks, we also added Pillar 7, i.e. 'People's attitude and behavior', which was considered as one of the reasons that these countries/regions have controlled the pandemic better than western countries [1]. In general, the populations of these countries were willing to wear masks very often and tended to be voluntarily self-restrained even without legal enforcement.

Figure 3 shows that Taiwan has controlled the pandemic better than South Korea and Japan. Among measures during the 'first wave' of the pandemic, the rapid and the strict border control, which was one of the features in Pillar 1, was considered to be one of the reasons for the difference; Taiwan banned foreign nationals that started from January 26, 2020 for Chinese from Hubei and extended it for all foreign nationals on March 24, 2020 [17]. The second and third waves seemed to be similar in South Korea and Japan, but more cases were confirmed and the durations were longer in Japan (Figure 3). Extensive tests and tracings, which comprise Korea's 3Ts strategy, i.e. test, tracing, and treatment, might have contributed to the better control of the second and third waves in South Korea [18]. Contact tracing was



**Figure 3** Daily new COVID-19 cases of Japan, South Korea, and Taiwan (cases per million people).

Source: COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. 2020. [Online Resource]. Available from: <https://github.com/CSSEGISandData/COVID-19>.

**Table 1** Comparison of selected COVID-19 responses in Taiwan, South Korea, and Japan

	Taiwan	South Korea	Japan
Pillar 1: Country-level coordination, planning, and monitoring			
Timely border control	✓	✗	✗
Enforcement measures	✓	✓	✗
Country-level preparedness	✓	✓	✗
Expert opinions on decision-makings	✓	✗	✗
Pillar 2: Risk communication and community engagement			
Information governance	✓	✓	✗
Pillar 3: Surveillance, rapid response teams, and case investigation			
Contact tracing	✓	✓	✗
Pillar 4: Vaccine monitoring			
Vaccine deployment/coverage	✗	✗	✗
Pillar 5: Testing policy and practice			
Number of tests per capita	✗	✓	✗
Pillar 6: Infection prevention and control			
Negative pressure isolation rooms	✓	✗	✗
Pillar 7: People's attitude and behavior			
Compliance with public health measures	✓	✓	✓

✓: strong; ✗: weak.

reported as one of the most important measures for controlling the COVID-19 pandemic [21]. The proportion of cases with an unknown route of infection was roughly 60% in the Kansai area in December 2020 [22], which was higher than that of Korea in December 2020, 25.1% [23].

On the other hand, the speeds of the COVID-19 vaccination were slower in Japan, Korea, and Taiwan compared to European and American countries; the proportions of those who received at least one dose of COVID-19 vaccine were lower than 2% as of March 31, 2021 in Japan [24].

In Japan, these features in Pillars 1–6 (except Pillar 4 due to poor vaccine deployment in all three countries/regions) have been implemented and disseminated less strictly, slowly, and less comprehensively than in South Korea and Taiwan. This might explain why Japan experienced higher incidence and would suggest a future risk of an infection explosion. One of the major strategies in Japan during the earlier period of the pandemic was avoiding ‘3 Cs’ (Closed spaces, Crowded places, and Close-contact settings) and it was adopted widely in other countries [25].

Overall, the Japanese responses were less strict, less prompt, and less comprehensive compared to those of South Korea and Taiwan and heavily relied on people's self-restraint. Now (many months into 2021) Japan is beginning to experience the fourth wave, where each wave is getting bigger and bigger at each step and people are becoming less and less self-restrained. A change in behavioral compliance could trigger an infection explosion under poor performance in the response set. Further monitoring is warranted to promote the evolution of the effective set of mitigation measures and to achieve success.

## SCOPUS author number

J Shin: 57208628069

H-R Lin: 56605147400

Y Imanaka: 20334553800

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## Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Conflict of interest

None declared.

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