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Letter

# Changes in Treatment Behavior during the COVID-19 Pandemic among Patients at a Cancer Hospital

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The treatment behavior of patients with cancer changed during the COVID-19 pandemic. The number of new outpatients and patients receiving surgery at a cancer hospital in Japan drastically decreased under and even after the state of emergency. This indicates that patients without established care patterns lost opportunities for cancer diagnosis and treatment.

The ongoing COVID-19 pandemic continues to dramatically affect the daily care of patients with cancer. SARS-CoV-2 infection can result in severe COVID-19 and high mortality among cancer patients (Bakouny et al., 2020), but another major problem is loss of opportunities to receive appropriate care including screening, routine tests, surgery, and chemotherapy (Corley et al., 2020).

In Japan, a state of emergency was declared by the government in response to COVID-19 on April 7, 2020. Emergency measures were first implemented in Tokyo and six other prefectures. The state of emergency was expanded to all prefectures on April 16 and was not lifted until May 25, 2020. By April 13, 2020, 7,509 cases (0.59 cases per 10,000 individuals) of COVID-19 had occurred nationwide, and Japan was experiencing the peak of the first wave of the pandemic. In response to these challenges, on April 13, 2020, The Cancer Institute Hospital of Japanese Foundation for Cancer Research (JFCR) established a screening clinic for outpatients with COVID-19-like symptoms. As we previously reported, the incidence of COVID-19 among cancer patients was low, even for symptomatic patients with typical computed tomography findings (Fujiwara et al., 2020). Therefore, careful management is required to preserve opportunities for diagnosis and treatment in patients with cancer during the COVID-19 pandemic. However, patient behavioral changes related to treatment during the pandemic in cancer hospitals have not been thoroughly investigated. Here we assessed behavioral trends among patients in a Japanese cancer hospital in response to the COVID-19 pandemic.

This was a retrospective, single-center, observational study. The number of patients visiting The Cancer Institute Hospital of the JFCR from April 13 to October 31, 2020, was prospectively determined, and numbers over the same period of the preceding 5 years (2015–2019) were collected retrospectively for comparison. The monthly numbers of patients receiving surgery and of outpatients treated with chemotherapy at the Ambulatory Therapy Center (ATC) were assessed. To compare changes in behavioral trends among patients associated with national and local incidence of COVID-19, we obtained numbers of daily new cases diagnosed by SARS-CoV-2 polymerase chain reaction (PCR) in Japan (Ministry of Health, Labour, and Welfare) and in Tokyo (Tokyo Metropolitan Government). Spearman's correlation coefficients were calculated for pairs of continuous variables using R version 2.4.0.

A total of 233,673 patients visited our hospital from April 13 to October 31, 2020. All patients were screened using a questionnaire, and 858 patients with potential symptoms of COVID-19 visited the screening clinic (Figure S1A). No patients were diagnosed with COVID-19 by SARS-CoV-2 PCR. There were only minor correlations between numbers of symptomatic patients and new PCR-positive cases nationwide ($R = -0.31$, $p < 0.001$) or in Tokyo ($R = -0.28$, $p < 0.001$).

Compared with the previous 5 years, the numbers of outpatients visiting our hospital decreased by 33.9% during the state of emergency and by 9.1% after the state of emergency was lifted (Figure S1B). There were only minor correlations between decreased outpatient visits and numbers of PCR-positive cases nationwide ($R = 0.28$, $p < 0.001$) or in Tokyo ($R = 0.27$, $p = 0.0017$). Additionally, no correlation between decreased outpatient visits and numbers of patients with COVID-19-like symptoms was observed ($R = -0.16$, $p = 0.057$).

Compared with the previous 5 years, numbers of new patients visiting our hospital decreased by 48.9% during the state of emergency and by 22.3% thereafter (Figure S1C). Comparing 2019 with 2020, the number of patients undergoing

surgery decreased by 34.0% in April, by 15.1% in May, and by more than 10% in subsequent months (Figure S1D). By contrast, although the number of patients receiving chemotherapy at the ATC decreased by 7.1% in April and by 12.4% in May, only minor decreases (<6%) or even slight increases were observed in subsequent months (Figure S1E).

Our study summarized the treatment behavior of patients at a cancer hospital in Japan during the COVID-19 pandemic. The number of cancer patients visiting our hospital in 2020 drastically decreased compared with the average over the previous 5 years. This decrease was not correlated with the number of new COVID-19 cases in Japan or in Tokyo but was correlated with the state of emergency; attendance recovered to some extent after the state of emergency was ended. This trend was similar for outpatients receiving chemotherapy at the ATC. These results suggest that many patients with established care patterns returned to routine treatments after the state of emergency was lifted, regardless of local and national trends in the COVID-19 pandemic.

By contrast, the number of new patients visiting our hospital decreased even after the state of emergency was lifted. A similar trend was observed for patients receiving surgery. These patients are generally thought to have earlier-stage cancer and are typically recently diagnosed. Our results suggest that patients with newly diagnosed cancers may have lost opportunities to visit our hospital and initiate cancer treatment amid the COVID-19 pandemic even after the statement of emergency was ended.

A previous cohort study showed that significant disruptions to cancer care and significantly decreased outpatient visits occurred during the pandemic period (Schmidt et al., 2020). Our study additionally indicates that cancer patients, especially those with recently diagnosed or potentially undiagnosed cancers without established care patterns, lost opportunities for diagnosis and treatment during the COVID-19 pandemic even if they did not have a diagnosis of COVID-19. Our data illustrate the importance of guiding patients toward cancer diagnosis, subsequent treatment, and follow-up to prevent loss of opportunities for cancer care during the COVID-19 pandemic.

## SUPPLEMENTAL INFORMATION

Supplemental Information can be found online at https://doi.org/10.1016/j.ccell.2021.01.002.

## DECLARATION OF INTERESTS

Y.S. reports personal fees from ONO Pharmaceutical Co., Ltd.; Bristol-Myers Squibb Company; MSD KK; and TAIHO Pharmaceutical Co., Ltd. outside the submitted work. N.F. reports personal fees from Eisai outside the submitted work. S.O. reports personal fees from Chugai, grants and personal fees from Eisai, grants and personal fees from TAIHO Pharmaceutical Co., personal fees from AstraZeneca, personal fees from Pfizer, personal fees from Eli Lilly, personal fees from Kyowa Kirin, and personal fees from Nippon Kayaku outside the submitted work. S.T. reports grants and personal fees from Bristol- Myers Squibb KK; grants and personal fees from ONO Pharmaceutical Co., Ltd.; grants and personal fees from MSD; grants and personal fees from AstraZeneca; grants and personal fees from Chugai; and grants and personal fees from Bayer outside the submitted work. The other authors report no competing interests to disclose.

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## Supplemental Information

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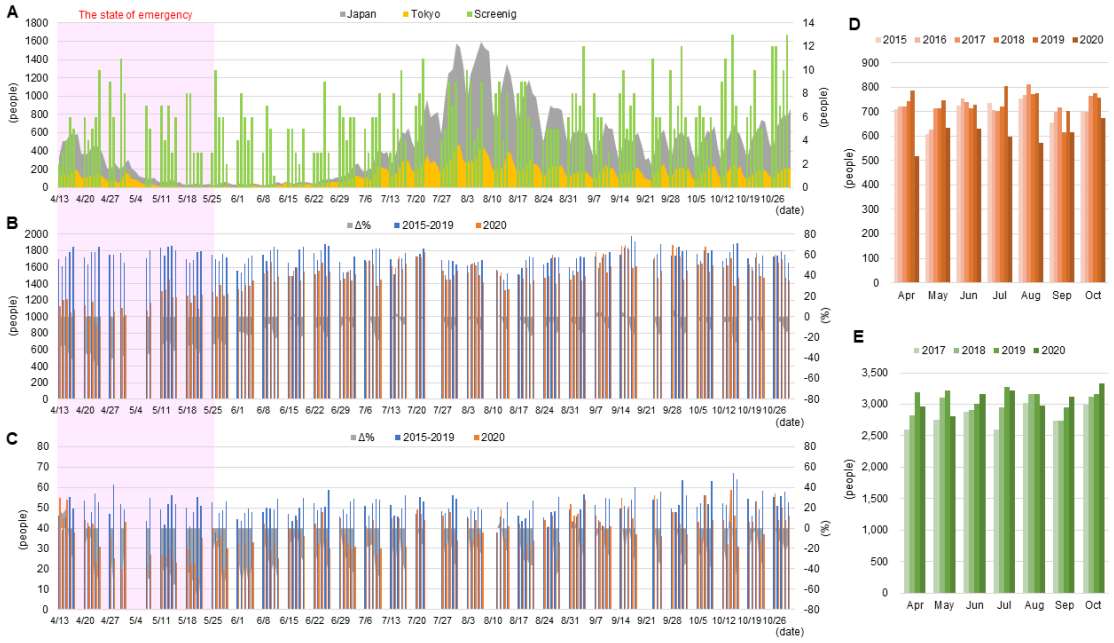


**Figure S1. Numbers of outpatients and of patients with surgery or ambulatory chemotherapy at a Japanese cancer hospital.** A. Numbers of symptomatic outpatients screened for COVID-19 at The Cancer Institute Hospital (per day, green bar). For comparison, numbers of new PCR-positive COVID-19 cases per day nationwide (gray area chart) and in Tokyo (yellow area chart) are shown. B. Numbers of outpatients seen in 2020 (per day, orange bar), average numbers of outpatients seen over the past 5 years (per day, blue bar) at The Cancer Institute Hospital (per day, green bar). The percentage of change in 2020 comparing to previous years (per day, gray area chart) is also shown. C. Numbers of new patients visiting The Cancer Institute Hospital in 2020 (per day, orange bar) and average numbers of new patients over the past 5 years (per day, blue bar). The percentage of change in 2020 comparing to previous years (per day, gray area chart) is also shown. D. Numbers of patients undergoing surgery at The Cancer Institute Hospital (per month) from 2015 to 2020. E. Numbers of outpatients receiving chemotherapy at the Ambulatory Therapy Center (ATC) (per month) from 2017 to 2020.