Changes in Surgeries and Therapeutic Procedures During the COVID-19 Outbreak

A Longitudinal Study of Acute Care Hospitals in Japan

Atsushi Miyawaki, MD, PhD,✉ *Jun Tomio, MD, MSc, PhD,* Masaki Nakamura, BE,† Hideki Ninomiya, MD,‡§ and Yasuki Kobayashi, MD, PhD*

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The COVID-19 pandemic has required all specialties to triage patients for surgery and therapeutic procedures.[1] Forecast reports suggest that numerous elective surgeries may be canceled.[2] These circumstances raise concerns that patients may be delaying or entirely omitting necessary care.[3] However, little is known about how many surgeries were reduced and which specialties were most affected during this pandemic. This study evaluated nationwide changes in the number of surgeries across specialties during the COVID-19 outbreak in Japan.

METHODS

This longitudinal study used a de-identified hospital administrative database (inpatient and outpatient setting) from Japanese acute hospitals that consented to the data utilization, built by Medical Data Vision Co, Ltd (Tokyo, Japan).[4,5] We analyzed the number of each medical practice (identified by reimbursement codes) for 186 continuously-observed hospitals (spanned across 43 out of the 47 prefectures in Japan) during the weeks 2 to 17 of 2019 and 2020. These 186 hospitals covered 7% of the nationwide acute care hospitalizations.

We described trends in surgeries, including therapeutic endovascular procedures and endoscopies, (a) overall and for 11 major specialties identified by reimbursement codes, including (b) brain and nervous system, (c) breasts, (d) cardiovascular system, (e) dermatology and plastics, (f) gastrointestinal and hepato-pancreato-biliary system, (g) gynecology, (h) obstetrics, (i) ophthalmology, (j) orthopedics, (k) otolaryngology, and (l) urology. For reference, we showed the weekly confirmed new COVID-19 cases. We estimated the change in the number of surgeries during the COVID-19 outbreak using a ''difference-in-differences'' model that included a variable for each week, the year indicator (2020 vs 2019), and an interaction variable between outbreak status (week 10–17, after the adoption of the first governmental policy for COVID-19) and the year indicator. Incidence rate ratios (IRRs) were estimated overall and by specialties using Poisson regressions with robust standard errors. To determine if there were changes in the number of surgeries for urgent versus nonurgent conditions, we conducted secondary analyses for the 3 most common urgent surgeries (endoscopic biliary stenting, ureteral stent placement, and emergency Cesarean sections) and nonurgent elective surgeries (cataract surgeries, subcutaneous benign tumor resection, and total hip arthroplasty / total knee arthroplasty) that were identified in the 2019 data. $P < 0.05$ was interpreted as statistically significant (Stata 15.1, College Station, TX). Ethics review was not required because no individual-level data were used.

RESULTS

The number of total surgeries decreased from 212,933 in weeks 2 to 9 of 2020 to 192,928 in weeks 10 to 17, a reduction of 9.4% [IRR, 0.91; 95% confidence interval (CI), 0.90–0.92; $P < 0.001$] (Fig. 1). The number of surgeries in weeks 2 to 9 versus weeks 10 to 17 of 2020 for brain and nervous system decreased from 3369 to 2916 (−13.4%; IRR, 0.83; 95%CI, 0.77–0.89), for cardiovascular system from 18,150 to 16,348 (−9.9%; IRR, 0.89; 95%CI, 0.86–0.91), for dermatology and plastics from 17,262 to 15,327 (−11.2%; IRR, 0.85; 95%CI, 0.83–0.88), for gastrointestinal and hepato-pancreato-biliary system from 34,787 to 31,466 (−9.5%; IRR, 0.91; 95%CI, 0.89–0.93), for obstetrics from 3392 to 2962 (−12.7%; IRR, 0.85; 95%CI, 0.79–0.91), for ophthalmology from 18,763 to 17,251 (−8.1%; IRR, 0.93; 95%CI, 0.90–0.96), for orthopedics from 21,418 to 18,901 (−11.8%; IRR, 0.91; 95%CI, 0.89–0.94), and for otolaryngology from 6820 to 5596 (−17.9%; IRR, 0.77; 95%CI, 0.73–0.81) ($P < 0.001$ for all). In contrast, we found no evidence that the number of surgeries for breasts (IRR, 0.94; $P = 0.09$), gynecology (IRR, 0.95; $P = 0.07$), or urology (IRR, 0.98; $P = 0.29$) declined.

The secondary analyses found no significant decrease in endoscopic biliary stenting (IRR, 0.95; $P = 0.23$), ureteral stent placement (IRR, 0.97; $P = 0.53$), or emergency Cesarean sections (IRR, 0.93; $P = 0.37$), but a decrease in cataract surgeries (IRR, 0.94; $P < 0.001$), subcutaneous benign tumor resection (IRR, 0.76;

From the *Department of Public Health, Graduate School of Medicine, the University of Tokyo, Tokyo, Japan; †Medical Data Vision Co, Ltd., Tokyo, Japan; ‡Department of Health Policy and Management, Keio University, Tokyo, Japan; and §Datack, Inc., Tokyo, Japan.

✉amiyawaki-tky@umin.ac.jp.

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Mr. Masaki Nakamura is one of the board of directors in Medical Data Vision Co., Ltd and received personal salary from it outside this study. Dr. Hideki Ninomiya supports the Medical Data Vision Co, Ltd. in algorithm construction and received personal fee outside this study. The other authors report no conflicts of interest.

Author contributions: Dr. Miyawaki had full access to the data in the study and takes responsibility for the accuracy and integrity of the data and its analyses.
Study concept and design: All authors.
Acquisition, analysis, or interpretation of data: All authors.
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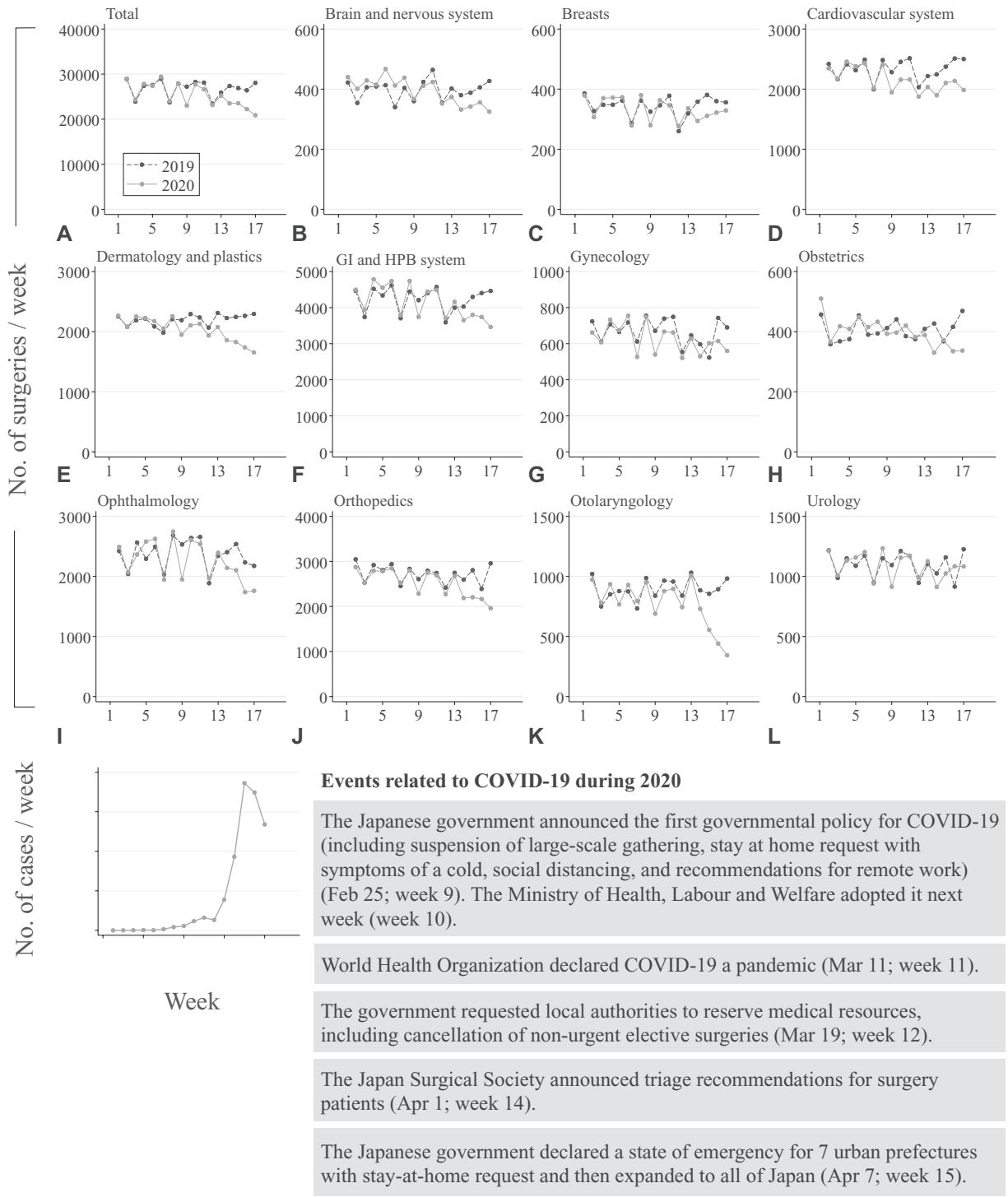

FIGURE 1. Trends in the number of surgeries overall and by specialty for Japanese Acute Care Hospitals during weeks 2 through 17 in 2019 and 2020. We identified surgeries for each specialty by using reimbursement codes for medical fee payments used throughout Japan. The number of surgeries in week 1 (the year-end and New Year Holidays) was very few and thus not shown. The figure of the weekly confirmed new COVID-19 cases (M) is based on the data reported by the Ministry of Health, Labor and Welfare. GI indicates gastrointestinal; HPB, hepato-pancreato-biliary.

$P < 0.001$), and total hip arthroplasty / total knee arthroplasty (IRR, 0.88; $P < 0.01$).

CONCLUSIONS

There were significant decreases in surgeries during the COVID-19 outbreak in Japan. The declines were evident for the majority of specialties, including those generally related to life-threatening conditions, such as the brain and nervous system and cardiovascular system. However, contrary to the forecast,[2] some specialties did not experience significant declines. Our findings highlight the importance of considering the impact of delaying surgery on long-term patient outcomes and hospital capacity separately by specialty.

These results may reflect a combination of several factors. First, surgical resources devoted to COVID-19 care might explain our findings. In week 12, the Japanese government requested that local authorities take measures to reserve hospital beds and medical personnel for the growing number of COVID-19 patients, including cancellation of non-urgent elective surgeries. Second, concerns for COVID-19 infection among healthcare workers, especially in procedures with high aerosol exposure, might have influenced hospitals to postpone surgeries.[6] The Japanese Society of Anesthesiologists announced precautions for the anesthesia management of suspected COVID-19 patients (week 10), and the Japan Surgical Society recommended deferring non-urgent elective surgeries for COVID-19 patients (week 14). For non-COVID-19 patients, the Japan Neurosurgical Society and the Otorhinolaryngological Society recommended postponing elective nasal surgeries (week 14), whereas other medical societies did not recommend the deferral of surgeries for non-COVID-19 patients. These precautions may be the reason for the dramatic decline in otolaryngology surgeries. Third, the varying reduction rates by specialties might reflect the difference in urgency profiles of surgeries. Our secondary analyses found that nonurgent surgeries significantly decreased, but urgent surgeries did not, suggesting that specialties with a higher proportion of nonurgent conditions (eg, dermatology and plastics, orthopedics, and ophthalmology[7]) might have been more likely to postpone surgery. Nevertheless, our findings showed specialties with a higher proportion of urgent conditions also experienced reductions in surgeries, suggesting this explanation would not account for all of our results. Another cause may include a drop in traumatic injuries. The number of traffic accidents in April 2020 was lower compared to the previous year.[8]

Limitations of this study include the patient population, which may not be generalizable to other countries. Japan has experienced fewer cases of COVID-19 than Western countries,[9] and the effects of crowding-out by COVID-19 patients and stay-at-home requests might be smaller. We did not survey all Japanese hospitals. Nevertheless, our dataset covered 186 hospitals, and the underlying patterns may be similar across Japan. Finally, the clinical consequences of decreased surgeries remain unknown and warrant longer-term studies.[10]

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