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Reflections on the coronavirus disease 2019 (COVID-19) epidemic: The first 30 days in one of New York's largest academic departments of surgery

Haejin In, MD, MBA, MPH[a,b,c,*], Peter Muscarella, MD[a,b], Erin Moran-Atkin, MD[a,b], Robert E. Michler, MD[a,b,d], William Scott Melvin, MD[a,c]

[a] Department of Surgery, Montefiore Medical Center, New York, NY
[b] Department of Surgery, Albert Einstein College of Medicine, New York, NY
[c] Department of Epidemiology & Population Health, Albert Einstein College of Medicine, New York, NY
[d] Department of Cardiothoracic and Vascular Surgery, Montefiore Medical Center, New York, NY

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Introduction

Surgeons have always been on the frontline for the management of many emergency and severe medical issues. Recent events have resulted in unprecedented challenges in the delivery of surgical care. The demands of the coronavirus disease 2019 (COVID-19) pandemic highlight the extraordinary resilience and adaptability of American health care providers and trainees while testing the capacity of the health care system. The courage and willingness of surgeons to participate in crisis management was demonstrated during the recent surge of COVID-19 patients in New York City (NYC)—the epicenter of the pandemic in the United States. Here we describe our experience during the first 30 days of the crisis.

First COVID-19 patients

Hospital alert systems were triggered in late January and early February 2020 as reports of the novel coronavirus cases in the United States began to emerge. The leadership at Montefiore Medical Center ([MMC] New York, NY) was monitoring the situation in early March 2020 when it became evident that NYC would become a hot spot. On Wednesday, March 11, 2020, MMC received its first 2 patients who tested positive for COVID-19. MMC is a 1,558-bed quaternary referral center consisting of 3 adult hospitals (Moses, Weiler, and Wakefield) and 1 children's hospital (Children's Hospital at Montefiore [CHAM]). Our system provides care to a many patients in the Bronx, the poorest large urban county in the United States. Greater than 25% of the population of 1.46 million people live in poverty and >85% of residents are black or Hispanic/Latino. The surgery residency program at MMC is one of the largest in the United States, graduating 10 residents per year, with 74 residents currently participating in graduate medical education at our center.

A national restriction on travel from Europe was announced on Friday, March 13, 2020. The Centers for Disease Control and Prevention (CDC) established guidelines restricting gatherings of 50 or more people on Sunday, March 15, 2020. Concurrently, the NYC mayor issued executive orders to close all bars, clubs, restaurants, and public schools. The City of New York reported 463 COVID-19 cases on March 16, 2020, and MMC had 8 confirmed cases, with 32 under investigation. Montefiore administration recommended surgical masks for all providers caring for patients suspected of having or confirmed of having infections. *N*-95 masks and contact precautions were recommended for procedures that could result in aerosolization. Testing was available on a limited basis and was reserved for patients exhibiting symptoms. All elective surgical procedures were cancelled. Two surgical residents developed COVID-19 symptoms. One tested positive and remained quarantined for total of 17 days. The other tested negative and returned to work the next day.

MMC takes action

During the next few days, the number of affected patients accelerated quickly. By Thursday, March 19, 2020, there were

* Reprint requests: Haejin In, MD, MPH, MBA, Department of Surgery, Montefiore Medical Center, Albert Einstein College of Medicine, 1300 Morris Park Ave. Block BD #112, New York, NY 10461.
E-mail address: hin@montefiore.org (H. In).

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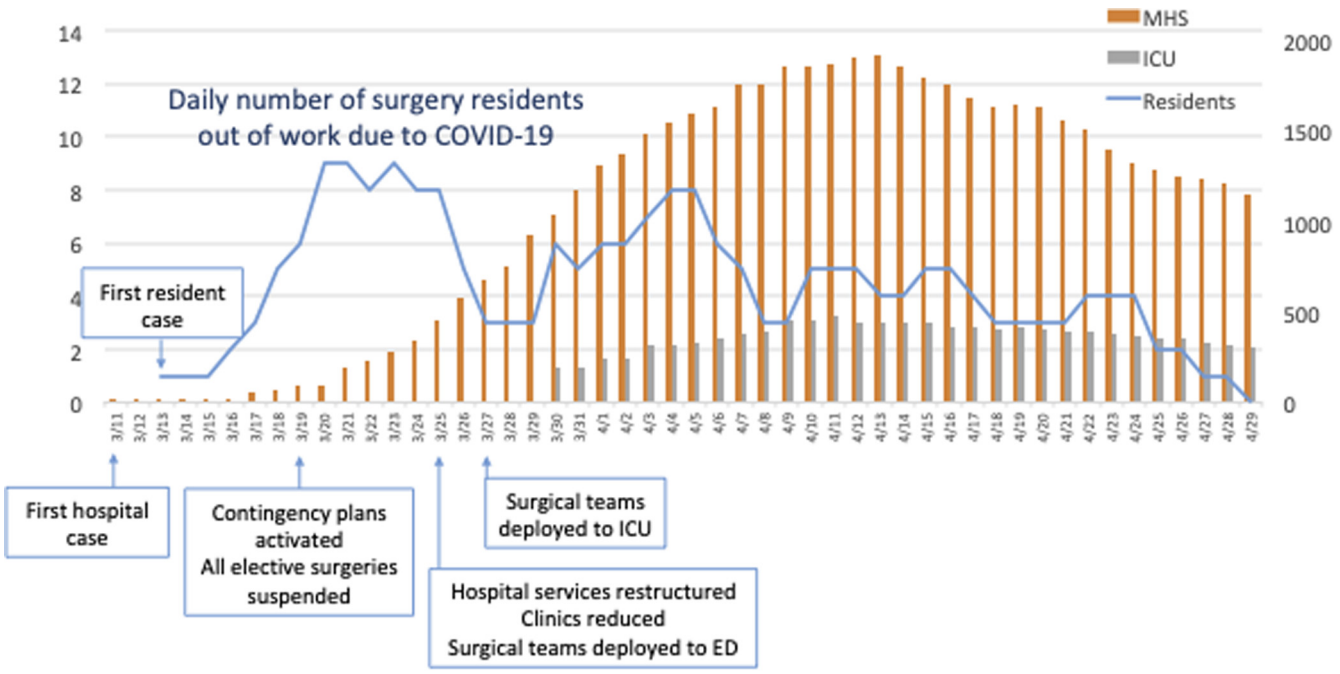

Fig. 1. Timeline of events. The Montefiore Health System daily coronavirus disease 2019 (COVID-19) patient census in total and ICU and the daily number of surgery residents out of work due to COVID-19.

93 confirmed COVID-19 patients and another 105 under investigation. Contingency plans were activated in preparation for a surge that was expected to overwhelm our inpatient capacity. All facilities, services, and personnel were redirected toward this effort. Only emergency surgeries were performed and required approval by the surgeon-in-chief. All general surgery clinics were consolidated into 3 clinics. Each clinic was staffed weekly by a single surgeon with minimal midlevel and resident support.

Five more residents developed COVID-19 symptoms. Testing remained scarce and the residents were unable to receive testing at MMC. Two residents obtained tests (both of which were negative) through the affiliated safety-net city hospital that provided state-issued tests. These residents were on medical leave for an average of 5 days, ranging from 3 to 9 days. On Monday, March 23, 2020, COVID-19 confirmed cases continued to climb, doubling every 2 to 3 days (66, 144, 217). Adequate supplies of personal protective equipment and COVID-19 tests were provided. All emergency department (ED), intensive care unit (ICU), and inpatient staff were provided with N-95 masks twice weekly. Surgical masks were provided to the remaining staff, with a limit of 2 per day. Occupational health services relaxed restrictions on testing, and all symptomatic employees were able to obtain COVID-19 testing. At this time, 51% of the nearly 2,000 tests that had been performed were positive.

MMC transforms

The 4 main MMC hospitals continued to transform infrastructure to meet the needs precipitated by the epidemic. The chair of surgery/surgeon-in-chief and the chairs of anesthesiology and internal medicine were tasked to establish and coordinate the effort of creating space and staffing for an additional 1,500 beds. Many faculty members, residents, nurses, midlevel providers, and clerical staff were redeployed. Areas of the hospital that were converted to dedicated COVID units and ICUs included all perioperative care units and most operating rooms. Sections of the CHAM and the 16 operating rooms in the ambulatory surgery unit were converted into adult ICU and inpatient units. The freestanding ambulatory surgery center was reconfigured to accommodate 186 patients. In addition to the 108 available ICU beds in the 3 hospitals, 153 new ICU beds were created, increasing capacity to 261.

During this time, new call schedules for all surgeons and surgical residents were created and distributed. Efforts were made to minimize staff exposure, provide support to the ED and ICUs, while MMC continued to provide care for surgical patients in and out of the hospital. Given that COVID-19 has an asymptomatic period of about 1 week, all shifts became 5-day continuous stretches followed by a period of low-risk duty. All employees were expected to contribute to the mission of the institution and the community that we serve. The 13 core Department of Surgery inpatient services, which are normally maintained by 36 faculty members and 67 residents in the 3 adult hospitals, were consolidated into 1 service for each hospital, covered by a day team and a night team. Each team consisted of 1 faculty member, a senior resident, a mid-level resident, and an intern or physician's assistant. Outpatient nurse practitioners were eventually reassigned to cover inpatient services to free up residents for redeployment. The remaining residents and faculty members were reassigned to assist with the burgeoning demand in the newly created ICUs. Surgery residents were assigned to 4 new ICUs. More than 8 surgical faculty members supervised the care of critically ill patients in these areas. In all, more than half of all surgery residents were assigned to critical care units. Three-quarters of the residents rotating at the affiliated safety-net hospital were deployed to COVID units or ICUs. Emergency surgeries performed during this time were minimal, on average fewer than 1 per day.

COVID-19 cases continue to rise

From March 24, 2020, to March 31,2020, COVID-19 cases continued to climb, doubling every 2 to 3 days (345, 464, 540, 612, 717). By the end of March, 18 residents had developed confirmed or

suspected COVID-19 and were quarantined at home. On average, residents were out for 7 days, with 2 residents out for 17 days (Fig). At the peak of the surge, 9 residents were on medical leave and an additional 3 were assigned to low-risk duty because of medical conditions such as pregnancy or immunosuppression.

From April 1, 2020, to April 10, 2020, COVID cases at MMC continued to increase (892, 942, 950, 984, 990). Surgical masks were now mandatory for all employees and patients in accordance with New York State mandates. Masks, including *N*-95s, were distributed at hospital entrances where employee temperature checks were also performed. Extreme restrictions were placed on hospital visitation. Capacity continued to expand rapidly as more operating rooms were converted into ICU beds, and the CHAM opened more beds for COVID patients. The hospital conference center and endoscopy units were converted into ICUs. Surgical faculty members and residents who had been deployed to the ED were reassigned to the ICU and medical services to relieve our critical care and medical colleagues. All surgical residents who were scheduled to take vacations selflessly deferred them to help their colleagues.

On April 8, 2020, the census of COVID-19 positive patients at MMC reached 1,098. At the Moses campus alone, there were 752 patients with 114 on ventilators in the ICU. The number of new admissions for COVID-19 reached 200 cases per day on April 8, 2020. On April 11, 2020, the hospital census of COVID-19 positive patients peaked at 1,148. By April 13, 2020, the greater Montefiore Health System, which also includes an additional 8 community-based hospitals in addition to its 4 main hospitals, had a combined census of 1,912 COVID-19 positive patients, of which 476 were in critical care units.

Hospitalizations begin to decrease

At the time of this report, the number of COVID-19 patients in our institution continues to decrease and is now down to 657. In all, 717 additional beds, including 153 ICU beds, were created to accommodate the needs of MMC patients. Between March 19, 2020, and April 17, 2020, only 58 surgeries were performed. In contrast, more than 1,000 surgeries were performed during the same time period in 2019. A total of 26 residents and 7 faculty members developed confirmed or suspected COVID-19, and 2 faculty members required admission to the ICU. Fortunately, all appear to be recovering with no catastrophic outcomes.

As the number of cases continues to decrease in NYC and at MMC, we are cautiously optimistic that some of the facilities and workers can return to their normal functions to address the surgical needs of our community and attend to unmet needs. This next hurdle will test our adaptability and creativity to meet the needs of this challenging time. However, we are confident that our surgeons and colleagues at other institutions will rise to meet this challenge.

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