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Rapid Response of an Academic Surgical Department to the COVID-19 Pandemic: Implications for Patients, Surgeons, and the Community.

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Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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# Rapid Response of an Academic Surgical Department to the COVID-19 Pandemic: Implications for Patients, Surgeons, and the Community

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- BACKGROUND:** As the coronavirus disease 2019 (COVID-19) pandemic continues to spread, swift actions and preparation are critical for ensuring the best outcomes for patients and providers. We aim to describe our hospital and Department of Surgery's experience in preparing for the COVID-19 pandemic and caring for surgical patients during this unprecedented time.
- STUDY DESIGN:** This is a descriptive study outlining the strategy of a single academic health system for addressing the following 4 critical issues facing surgical departments during the COVID-19 pandemic: developing a cohesive leadership team and system for frequent communication throughout the department; ensuring adequate hospital capacity to care for an anticipated influx of COVID-19 patients; safeguarding supplies of blood products and personal protective equipment to protect patients and providers; and preparing for an unstable workforce due to illness and competing personal priorities, such as childcare.
- RESULTS:** Through collaborative efforts within the Department of Surgery and hospital, we provided concise and regular communication, reduced operating room volume by 80%, secured a 4-week supply of personal protective equipment, and created reduced staffing protocols with back-up staffing plans.
- CONCLUSIONS:** By developing an enabling infrastructure, a department can nimbly respond to crises like COVID-19 by promoting trust among colleagues and emphasizing an unwavering commitment to excellent patient care. Sharing principles and practical applications of these changes is important to optimize responses across the country and the world. (J Am Coll Surg 2020; ■:1–10. © 2020 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)
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In December 2019, a series of unexplained pneumonia cases were identified in Wuhan, China that were later traced to a new strain of coronavirus, novel coronavirus

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disease 2019 (COVID-19).<sup>1-3</sup> The virus rapidly spread throughout China and then to other countries, leading to the declaration of a pandemic from the WHO on March 11, 2020.<sup>4</sup> We have learned from earlier pandemics, most recently H1N1 influenza in 2009,<sup>5</sup> that swift actions and preparation are critical for ensuring the best outcomes for patients and providers. In addition to public health interventions, such as social distancing, responsible handwashing, and sheltering in place to reduce the number of people infected, healthcare systems are preparing for extreme surges in the number of critically ill patients involved, given estimates that up to 20% of infected patients will require hospitalization and the in-hospital mortality rate could be as high as 28%.<sup>6</sup>

The initial response to COVID-19 focused on containment; however, once there was known community transmission in the US, it was clear that this rapidly evolving pandemic would have a broad impact on clinical care

**Abbreviations and Acronyms**

COVID-19	= coronavirus disease 2019
PPE	= personal protective equipment
UCSF	= University of California, San Francisco
VA	= Veterans Affairs

and healthcare resources. The American College of Surgeons and the US Surgeon General recommended the reduction of surgical volume in anticipation of further spread of COVID-19.<sup>7,8</sup> However, operational guidance with regard to how to prioritize patients, staff surgical services, and protect our surgical workforce in the operating room was left for local groups to determine.

With the first recognized cases of COVID-19 arising on the west coast (Washington state, January 19, 2020), the San Francisco Department of Public Health began preparing on January 24, 2020.<sup>9</sup> The University of California, San Francisco (UCSF) Hospital treated the first San Francisco patient with COVID-19 on February 3, 2020; this patient had a known travel exposure. Community spread (ie COVID-19 developing in patients without travel exposure) came to light in Northern California on February 27, 2020, when a patient who had no noted COVID-19 exposure was diagnosed with COVID-19. This patient was treated in Sacramento, CA, about 75 miles north of UCSF. In this case, diagnosis was delayed and the patient was hospitalized for several days before being tested for COVID-19. Documented community spread in our area served as a bellwether, after which our health system developed an accelerated COVID-19 mitigation and surge plan. In parallel, our local government also responded swiftly, with the 5 counties in the San Francisco Bay Area initiating shelter-in-place orders, which went into effect on March 16, 2020 and are currently in place until May 1, 2020.

As an academic medical center in a geographic region with early COVID-19 exposure and spread, we aim to describe the UCSF Hospital and Department of Surgery's experience in preparing for the COVID-19 pandemic and caring for surgical patients during this unprecedented time. We describe our strategy for addressing the following 4 critical issues for surgical departments: developing a cohesive leadership team and system for frequent communication throughout the department; ensuring adequate hospital capacity (acute care and ICU beds) to care for an anticipated influx of COVID-19 patients; safeguarding supplies of blood products and personal protective equipment (PPE) to protect the patients and providers; and preparing for an unstable (and potentially dwindling) workforce due to illness and competing personal priorities, such as

childcare. An overview of key activities within each of these critical workstreams is illustrated temporally in [Figure 1](#).

**METHODS**

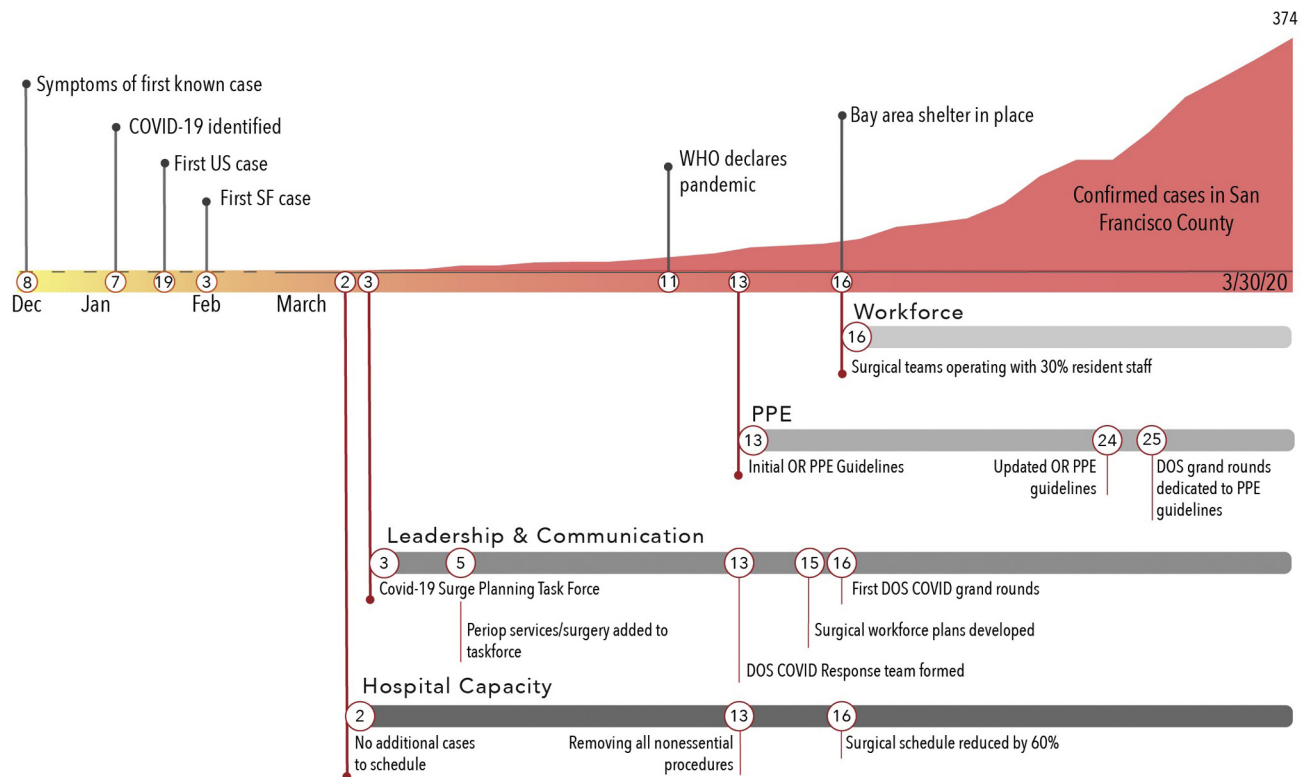
This is a descriptive analysis of a single academic health system's preparation and response to the COVID-19 pandemic. UCSF Health is a more than 1,000-bed hospital system composed of a university hospital spread across 3 campuses and provides faculty and trainee physician care at 2 public partner sites: Zuckerberrg San Francisco General Hospital and Trauma Center and San Francisco Veterans Affairs (VA) Health Care System. UCSF Health has more than 45,000 inpatient admissions per year and more than 1.7 million outpatient visits. The UCSF Department of Surgery is composed of 11 divisions and sections with 75 full-time faculty, 69 ACGME residents, 24 ACGME and non-ACGME fellows, and 40 medical students (on the surgical service at one time) across 3 hospital systems (university hospital, VA hospital, and community safety-net hospital).

**Leadership and communication****UCSF Health**

In anticipation of the spread of COVID-19 in the US and uncertain changes in patient care needs, the UCSF Health System developed a COVID-19 Surge Planning Taskforce on March 3, 2020 to prepare for the care of COVID-19 patients and for a potential surge of hospitalized patients. This Taskforce developed a surge algorithm that was divided into 3 tiers driven by the number of COVID-19-positive patients both in the San Francisco area and at UCSF Health System, as well as staff shortages ([Fig. 2](#)). On March 5, 2020, perioperative services and surgery representatives were added to the COVID-19 Surge Planning Taskforce after it was recognized that adjusting perioperative care would be a crucial step in managing available resources, including hospital beds, ventilators, blood products, and PPE.

**Department of Surgery**

Within the Department of Surgery, a central COVID-19 response team was developed that included the department chair, 2 designated COVID-19 leads, and the chief administrative officer on March 9, 2020. By March 13, 2020, it was apparent that the COVID-19 pandemic would drastically affect all 3 missions of the department, which include clinical care; fellow, resident and student education; and scientific research. To implement what would need to be drastic changes to the function of the department, a larger council was formed that encompassed all of the division chiefs (cardiothoracic, pediatric, plastic, transplantation, vascular, and general surgery, which includes the sections



**Figure 1.** Coronavirus disease 2019 (COVID-19) timeline. DOS, Department of Surgery; OR, operating room; PPE, personal protective equipment; SF, San Francisco.

of gastrointestinal, endocrine, breast, colorectal, and surgical oncology), the vice chairs of education, research, faculty affairs, and diversity equity and inclusion, as well as the residency program leadership.

As the COVID-19 pandemic evolved rapidly, there was a constant stream of new information, often leading to considerable fear and confusion. As a result, all meetings were changed from in-person to video conferences, and the Department replaced weekly grand rounds with relevant COVID-19 updates. The first COVID-19 grand rounds was presented by UCSF Division of Infectious Diseases on March 18, 2020, followed by weekly town halls on key COVID-19-related topics, including PPE, revised operating room protocols, epidemiology underpinning of a pandemic, and prediction modeling. Weekly digests from the Department of Surgery were sent to all faculty, staff, and learners to augment daily notifications coming from the health system and/or School of Medicine and to address surgery-specific issues.

### Hospital capacity

To anticipate an influx of COVID-19 patients, the Perioperative Leadership Team, a triad composed of a senior surgeon, anesthesiologist, and nurse, combined with the Departments

of Surgery, Anesthesia, Otolaryngology and Head and Neck, Urology, Neurosurgery, Orthopaedics, Obstetrics and Gynecology, and Ophthalmology, implemented a plan to reduce the operating room schedule by 25% starting March 2, 2020. This was initially accomplished by not permitting additional cases to be added to the schedule for March 2 through 15, 2020. On March 5, 2020, perioperative services and surgery were added to the COVID-19 Surge Planning Taskforce, which initiated a more aggressive strategy to remove patients planned for nonessential procedures from the surgical schedule starting on March 13, 2020.

Initial triage guidelines were created to inform which cases could remain on the schedule. These decisions were left mainly to the discretion of the faculty and defined “essential cases” as those for which the patient would have an “adverse outcome if surgery was not performed within 7 days.” To help facilitate triage, additional fields were added to the electronic health record case request to allow real-time triage into high-, normal-, and low-priority cases based on criteria we will outline. All surgeons were required to document the status of new patients needing operations and patients already scheduled for operations, which has since become a routine part of case scheduling in the electronic health record.

SURGE LEVEL	Emergent and Urgent Cases	Elective OR and Procedural Cases	Transfer Center
<b>GREEN:</b> <6 PUI/COVID+, and Staffing: No staffing shortages	Assure ORs and surgeons available to rapidly operate and discharge ED cases (appy/chole/hip fx etc.) and have capacity for urgent cases	1. Notify periop to place hold on all schedules for next 7 days 2. Review OR and procedural schedules for non-urgent cases to cancel when yellow	Align Service Protocol
<b>YELLOW: Surge</b> 7-24 PUI/COVID+, or Staffing: <15-20% workforce out	Assure ORs and surgeons available to rapidly operate and discharge ED cases (appy/chole/hip fx etc.) and have capacity for urgent cases	1. Close OR schedule at Parnassus for elective patients requiring an inpatient stay. 2. High priority cases will be scheduled, as designated on case request. b. High priority status patients, as designated by the department chair or their designee (patients that require urgent surgery within 1 week or prognosis will be negatively impacted by delay) will be prioritized for scheduling. c. 3. The schedule will be open for adults at MB, MZ for cases requiring a bed and for come/go pts 4. There will be debrief at 6:30 am M-F (Chair or designee, Periop leadership) to discuss hospital, COVID-19 and PUI patient census, staffing and final decisions regarding the OR schedule.	Time-Sensitive Protocol
<b>RED:</b> >24 PUI/COVID+, or Staffing: >21% workforce out	Assure ORs and surgeons available to rapidly operate and discharge ED cases (appy/chole/hip fx etc.) and have capacity for urgent cases	1. Mission Bay cases prioritized as for Parnassus yellow level 2. Close Mt. Zion	Closed to all Transfers
<b>BLACK: Significant assistance from outside UCSF needed</b>		Cancel all OR cases	Closed to all Transfers

**Figure 2.** Surge-level operating room (OR) protocols. appy/chole/hip fx, appendectomy, cholecystectomy, hip fracture; COVID+, coronavirus disease-positive; ED, emergency department; MB, Mission Bay; MZ, Mt Zion; periop, perioperative; pts, patients; PUI, person under investigation; UCSF, University of California, San Francisco.

As we saw critical healthcare shortages in countries such as Italy and China, a more structured triage process was implemented. Elective surgical cases were prioritized by urgency, which was determined based on the following criteria: anticipated outcomes of delaying operation, such a disease progression; options for alternative nonsurgical treatment; and anticipated resource use (blood, ventilators, ICU, and hospital beds).

It was recognized at this point that the triage was nuanced and slightly different for each specialty area and disease. Therefore, each separate clinical section or division was asked to collectively develop their specialty-specific criteria using available resources from surgical societies, including the American College of Surgeons, Society of

Surgical Oncology, and Society of American Gastrointestinal and Endoscopic Surgeons.

### Personal protective equipment

The UCSF Health System leadership, together with leadership from the clinical departments, iteratively developed PPE guidelines based on guidance from the WHO, CDC, and American Society of Anesthesiologists,<sup>10-13</sup> emerging evidence of COVID-19 transmission in the healthcare setting, and consideration of available PPE resources. Separate guidelines were developed and updated for PPE use in the operating room and in regular clinical care, such as the wards or emergency department (described in Results section). These were created initially



but then updated after the American Society of Anesthesiology statement on PPE use in the operating room was issued on March 23, 2020.

In parallel with developing the progressively more expansive PPE guidelines, PPE reuse guidelines were shared. Providers were instructed to reuse their N95 respirators, to limit the number of team members entering an isolation room, and to bundle care whenever possible to limit the number of entries into the room of any patient on isolation. In addition to decreasing PPE use, UCSF Health is actively working on procuring PPE through donations from individuals in the community, as well as large-scale philanthropic efforts. In addition, the hospital has worked to secure new supply-chain sources and initiate mechanisms to use nontraditional PPE, such as 3-dimensional-printed face masks and reusable gowns.

To disseminate the revised guidelines and current best practices to members of the Department of Surgery, a mandatory grand rounds was delivered by the UCSF Medical Director of Infection Prevention and the Chief Clinical Officer on March 25, 2020, devoted exclusively to discussion of appropriate PPE use and updated guidelines. After this grand rounds, a mandatory knowledge assessment was sent to all clinical members of the department. Additionally, to ensure all members were appropriately fitted and obtained necessary PPE, a survey was sent to all members to inventory their most recent fit testing and schedule emergent fit testing appointments as needed.

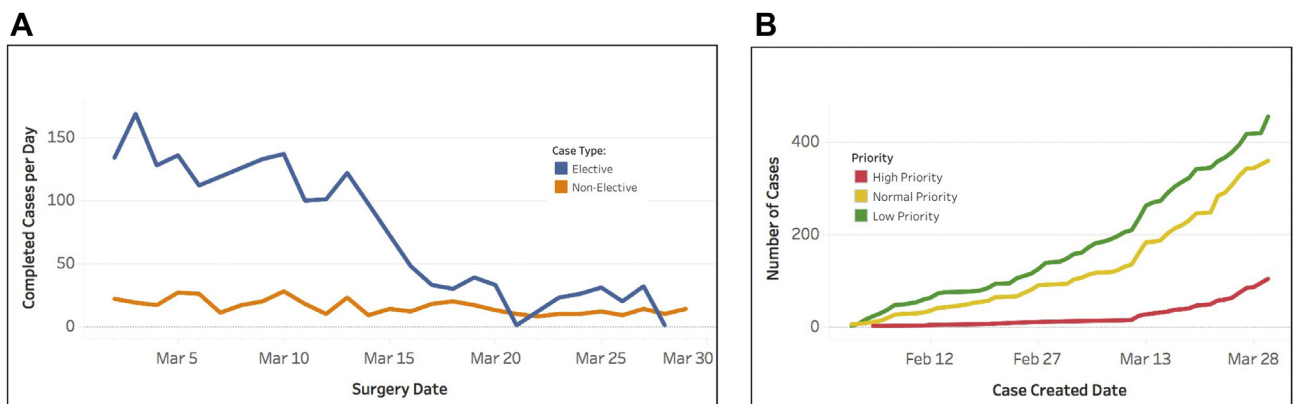
### Unstable workforce

Changing requirements for self-quarantine due to exposure, symptoms, or travel, along with abrupt school closures and uncertain childcare plans, lead to anticipated last-minute changes in the workforce. To ensure

appropriate adjustments from all divisions, the Department of Surgery developed and communicated a clear surgical workforce plan with the goal of minimizing exposure and optimizing human resources, as follows:

1. Identifying key skills within each group and ensuring redundancy should members be unable to work;
2. Limiting faculty activities to a single hospital site;
3. Reducing the number of providers (faculty and residents) in the hospital from each service on each day and, when possible, having the same team work for 3 to 5 days in a row to allow services to have a “bench” of providers should an exposure occur on the service;
4. Developing division- and service-specific approaches for patients with suspected or confirmed COVID-19; and
5. Identifying leadership contingency plans in the division or section in the event the chief was unable to report to work.

To better plan for and accommodate rapid changes in the workforce, the department developed an electronic attendance-reporting system (using smartsheets) for both residents and faculty to monitor for concerning symptoms and ensure that all outages were noted centrally and addressed immediately. In addition to immediate modifications to the daily workforce, a disaster plan was also developed in the event of major reductions in staffing across the entire hospital. The disaster staffing plan identified core competencies that would be required to maintain basic general and cardiovascular services at the hospital, as well as the candidate faculty and fellows who could provide those services. This core group was preserved for the Department of Surgery and those faculty who were not comfortable providing those services were identified as potential faculty to redeploy to other work areas, such as the inpatient units and emergency



**Figure 3.** (A) Operating room case volume last 30 days and (B) cases waiting to be scheduled.

department. This strategy was developed across all 3 main sites the department faculty staff—Zuckerberg San Francisco General Hospital, San Francisco VA Medical Center, and UCSF Health. Zuckerberg San Francisco General Hospital is the only Level I trauma center for the entire county. Therefore, core faculty from the other sites, not normally on the trauma service, who were comfortable with trauma, were identified and credentialed at Zuckerberg San Francisco General Hospital in the event of a major workforce shortage. Fellows were planned to be redeployed as faculty. A resident system was developed to efficiently identify and organize trainees that were not currently on clinical rotations (ie laboratory residents) and could transition into clinical care should it become necessary.

In concordance with local government guidelines, all staff and visitors were screened for symptoms on entrance to the hospital starting March 16, 2020. To prevent community spread within families, UCSF Health partnered with the JW Marriott San Francisco Union Square to provide up to 3 nights of free accommodation for front-line workers with appropriate needs or a desire to self-isolate. This was an additional effort to try to preserve our workforce.

## RESULTS

### Leadership and communication

Beginning on March 9, 2020, the Department of Surgery Central COVID-19 Response Team met twice daily, and the Council of Chairs and Vice Chiefs met daily. Weekly COVID-19-centered grand rounds were held on March 18, March 25, and April 1, 2020. Grand rounds attendance for the first 3 COVID-19 topics was more than 1,000, more than 250, and more than 200 people, respectively, and included members of the larger hospital community. Response rate for the required 5-question assessment on PPE use guidelines was 100% for faculty, fellows, and residents. In addition to university-wide communication, there were weekly succinct COVID-19 updates for all faculty- and trainee-focused communication as needed.

### Hospital capacity

The overall weekday operating room volume from the Departments of Surgery, Orthopaedic Surgery, Urology, Otolaryngology, Head and Neck Surgery, Ophthalmology, and Gynecology at UCSF was reduced by 60% from baseline by March 16, 2020 and by 80% on March 24, 2020 (Fig. 3A). The most dramatic reduction seen within the Department of Surgery was in the Division of Plastic Surgery, which has a high percent of elective and low-priority cases. Our outpatient/23-hour stay

surgery center was completely closed to operations and repurposed as a dedicated COVID-19 hospital providing an additional 46 inpatient acute care beds.

As of March 25, 2020 there were a total of 748 surgical cases ordered by the above surgical departments, but waiting to be scheduled due to changes in the operating room booking policies (Fig. 3B).

### Personal protective equipment

The Department of Surgery organized and provided fit testing to ensure that 100% of faculty and clinical staff were provided safe and appropriate airborne isolation masks. Initial PPE guidelines for operating room and regular clinical care were published on March 13, 2020. Based on changes in PPE supply due to a large private donation, updated PPE guidelines were published on March 26, 2020.

Operating room guidelines include clear and specific descriptions of PPE to be used for COVID-19 person under investigation or confirmed cases, asymptomatic patients requiring high-risk operation, and asymptomatic patients with low-risk operation with or without intubation. Details included were the type of mask, face shield, gloves, and gowns to be used, as well as clear descriptions of how masks should be reused (Table 1).

The revised guidelines for routine clinical care, including ICU, wards, and emergency department require airborne precautions (with N95 or powered air-purifying respirator) only for patients with confirmed or suspected COVID-19 undergoing aerosol-generating procedures like intubation, high-flow nasal cannula, noninvasive ventilation, and/or tracheostomy. All other suspected or confirmed COVID-19 patients required respiratory droplet plus contact isolation with surgical mask, eye protection, gown, and gloves. Additionally, the new universal surgical mask policy began on March 29, 2020, requiring all hospital personnel to wear a surgical mask when in the hospital or any clinical settings. A single mask is provided at entry screening checkpoints and the recipient is to wear the same mask for the duration of their shift unless it becomes soiled, wet, or needs to be replaced with different PPE (Table 2).

In addition to PPE-conserving policies, efforts to increase PPE through donations were very successful. Due to local donations and a large-scale donation of 500,000 surgical masks, the current surgical mask supply in the UCSF Health System is anticipated to last 4 to 6 weeks based on current guidelines.

### Unstable workforce

With support from the Surgical COVID-19 Command Center, all surgical divisions completed workforce plans



**Table 1.** Personal Protective Equipment Algorithm for the Operating Room

Scenario	PPE		Notes
	Anesthesia provider	Surgery/nursing/scrub	
1. COVID-19 person under investigation/confirmed for any operation	Single-use N95 + face shield/goggles or PAPR; gown; double gloves	Single-use N95 + face shield/goggles or PAPR; gown; double gloves	Minimize number of providers present
2. Asymptomatic patient for high-risk operation	Reusable N95 + face shield/goggles or PAPR; gown; double gloves	Reusable N95 + face shield/goggles or PAPR; gown; double gloves	PPE to be worn by all members throughout procedure; minimize number of providers present
3. Asymptomatic patient for low-risk operation involving GA	Reusable N95 + face shield/goggles or PAPR for airway placement; gown; double gloves	Standard PPE if not present for airway placement, otherwise same as anesthesia providers	Non-anesthesia providers leave room for intubation/extubation and 15 min after; if 15-min interval is not possible (ie cesarean section), follow scenario 2
4. Asymptomatic patient for low-risk operation without GA	Standard PPE	Standard PPE	If risk of conversion to GA is likely, follow scenario 3 from the start

COVID-19, coronavirus disease 2019; GA, general anesthesia; PAPR, powered air-purifying respirator; PPE, personal protective equipment.

within 24 hours. Overarching themes from workforce plans include the following:

1. Limiting in-person clinic visits and maximizing use of telehealth visits;
2. Only essential personnel in clinic, eliminate redundancy in patient contact (no residents at in-person clinic visits);
3. Operating room case triage and reduction (see next section);
4. Combining surgical services as surgical patient volume decreases to reduce provider needs;
5. Developing back-up provider plans in situations of illness or quarantine; and
6. Restricting patient care activities to 1 hospital per provider.

The general surgery services at UCSF Health combined services as volume decreased and, as a result, were able to reduce resident staffing by 67% (Fig. 4). Additionally, the resident rotation schedule was adjusted to ensure that residents remained at a single hospital during the rise of the pandemic to prevent cross-contamination across geographic sites. Similarly, attending physicians were assigned to cover only 1 hospital.

To promote social distancing and protect patients and providers, all clinic appointments that did not require in-person visits were cancelled or converted to telehealth appointments. By March 20, 2020, 50% of clinic visits were performed virtually and by March 27, 75% of visits were completed virtually.

To ensure that education continued during this time, all grand rounds and resident conferences were converted

**Table 2.** Personal Protective Equipment Algorithm for Routine Clinical Care

Scenario	Protocol	PPE	Notes
All employees, healthcare workers, visitors, and trainees entering clinical buildings*	Universal mask policy	Surgical mask	One mask will be provided on entry; to be used for that day/shift until it becomes wet, soiled, or alternate PPE is needed
Rule out or confirmed COVID-19 requiring aerosolizing procedure	Novel respiratory isolation	N95 or PAPR; gown and gloves; eye protection	Negative-pressure room
Rule out or confirmed COVID-19 not requiring aerosolizing procedure	Droplet plus contact isolation	Surgical mask; gown and gloves; eye protection	Standard room

\*Added March 29, 2020.

COVID-19, coronavirus disease 2019; PAPR, powered air-purifying respirator; PPE, personal protective equipment.

to virtual classrooms. Third-year medical students were removed from all clinical settings per published protocols from the Association of American Medical College; sub-interns returned to their rotations on April 1, 2020.<sup>14</sup>

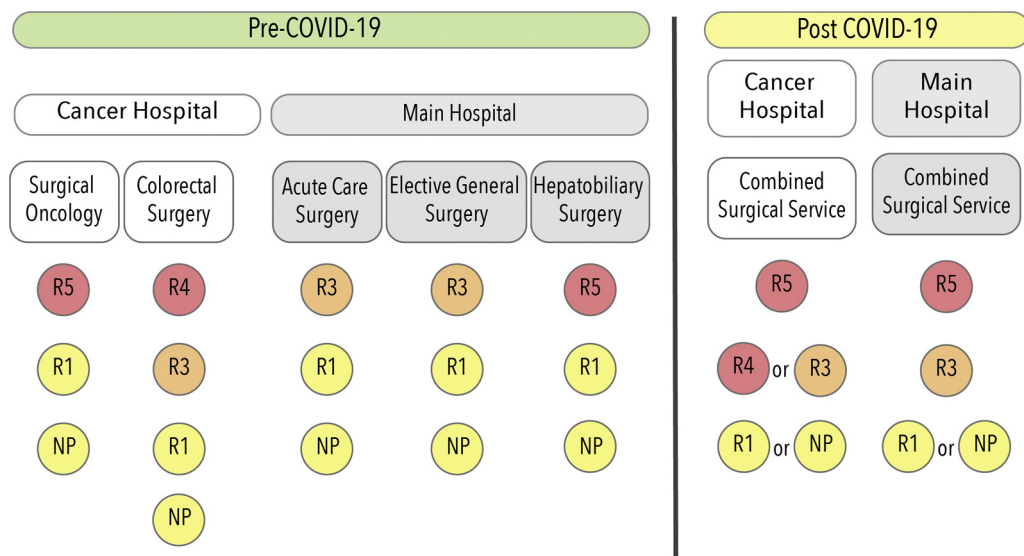
## DISCUSSION

As the US moves into uncertain times with regard to the COVID-19 pandemic, we are hopeful that as an institution and department, we have taken the necessary measures and made the tough decisions that will allow us to continue to safely and effectively care for surgical patients requiring urgent interventions, as well as the mounting COVID-19 public health crisis. It is remarkable that in 2 weeks we have dramatically changed the way we approach surgical care and come together as a community for the greater good of our city and patients. The speed with which this has occurred is unprecedented. Historically, guidelines have been updated, on average, every decade. For example, the CDC Surgical Site Infections Guidelines spanned 18 years (1999 to 2017). In contrast, the UCSF PPE guidelines have been updated daily. This rapid response has been facilitated in part by the transdisciplinary engagement at UCSF Health and the Department of Surgery, as well as by the increasingly connected surgical community around the country and world. Much efficiency was gained by having guidelines from colleagues at other institutions to serve as starting points for our efforts. For example, the UCSF Health PPE guidelines for the operating room were accelerated by reviewing the Johns Hopkins Medicine operating

room PPE guidelines. Similarly, the Department of Surgery staffing approach was informed by that put forward by the National University Hospital in Singapore.

Reflecting on our experience, a key component of our nimble approach was the development of a small, tightly knit leadership team. The Department of Surgery requested and received representation on all COVID-19 working committees (ie PPE, virtual communication, clinical, and COVID-19 hospital planning), and became a resource for the greater surgical community with regard to details around the rationale for the recommendations, as well as the basics of COVID-19 (ie symptoms, employee-screening process, and testing approach). Importantly, the leadership group rapidly facilitated addressing the department's questions (such as management of COVID-19-positive faculty) with the local experts when needed. This was essential in a very complex and rapidly changing landscape to dispel falsehoods, address real concerns, and escalate issues to hospital leadership.<sup>8,15-17</sup>

In addition, as part of all communication, including phone calls, grand rounds, and town halls, trust was emphasized. Surgeons are notoriously competitive, but we emphasized that in this time of uncertainty, we are all in this together and we need to develop a new level of trust with our colleagues, in both our small (section and division) and larger (department and campus site) communities. For example, within divisions, because of the restricted hospital-based staffing, some patients were reassigned to other surgeons who had similar skill sets. Throughout the



**Figure 4.** Changes to university hospital general surgery teams in response to coronavirus disease 2019 (COVID-19). R, resident; NP, nurse practitioner.

department, it was essential that there was a level of trust between providers that everyone was prioritizing what was right for the patients and staying within the parameters of the case triage system. Time was too short to review every case at an institutional level.

An important lesson in our first few weeks of addressing COVID-19 relates to the complexity of academic surgical departments. Today, most academic departments encompass faculty that perform operations at many hospitals. As a department comes together in a crisis like this, it is essential that the leadership is sensitive to the unique policies and microenvironments in which our faculty and learners practice. For us, this was highlighted with the PPE policy. UCSF Health was a day or 2 ahead of Zuckerberg San Francisco General Hospital and the San Francisco VA Medical Center with regard to PPE use standardization. This caused a sense of inequity and concern around potentially increased exposure for faculty based at the latter 2 sites. After this lesson learned, when developing a guideline around the use of laparoscopy in the era of COVID-19, the leadership team was sensitive to develop one that would work in all 3 practice environments, where there are variations in supplies, equipment, and vendors.

Although too early to tell, we might have had more time to prepare for the pandemic compared with our colleagues in other major metropolitan areas. The city of San Francisco was proactive in implementing city ordinances with regard to hospital visitor restrictions, employee screening at the time of reporting to work, and shelter in place. The benefit of city ordinances was that we had clear direction and were charged simply with execution. We hope that this approach is considered in other areas and for future pandemics, as we believe it greatly accelerated our response and promoted the health and safety of our patients and workforce.

An important limitation of this report is the lack of outcomes to support our methods; however, this is a work in progress, a summary of where we are now. With time, we will know whether we potentially have a lower rate of COVID-19-positivity among healthcare workers, greater ability to still take care of urgent surgical patients in the pandemic setting, and even better outcomes because of our early, organized response. With the healthcare landscape changing in the setting of daily (even hourly) updates to our understanding of the course of the COVID-19 pandemic, it is critical that we come together as a surgical community to efficiently

disseminate high-quality information based on experience and data. Virtual communication has permitted an agility in sharing best practices, recording and codifying them, and then adjusting them to the unique local milieu, allowing providers to respond faster and wiser. We are hopeful that some of our guidelines and lessons learned in this article will help others weather this uncharted territory.

As the COVID-19 pandemic evolves, it is critical we learn from the data and experiences of other countries to develop evidence-based practices (to the extent that evidence exists).<sup>13</sup> Surgeons worldwide are learning from the experiences of laparoscopic/minimally invasive surgeons in Italy and China,<sup>18</sup> and case reports of surgical patients who were infected with COVID-19 in Iran inform our approaches around acute care surgery during this tenuous time.<sup>19</sup>

We will continue to study how our department's methods have supported our institution and community as the pandemic evolves and how our system functions if or when we see a dramatic surge in critically ill patients. Dashboards have been developed to transparently monitor the backlog of patients awaiting surgical treatment. It is anticipated that working through this backlog will be complex as COVID-19 anxiety continues to heighten and evolve. Even today, many patients are uncertain whether they should undergo a lifesaving operation with the concomitant risk of acquiring COVID-19 in the hospital; payors are questioning the need for operations; and staff are constantly assessing their workplace risk. The future is uncertain and with no signs of abatement, understanding the repercussions of our actions and the COVID-19 on surgery will be critical in the learning process.

## CONCLUSIONS

By developing an enabling infrastructure, a department can nimbly respond to crises like COVID-19 by promoting trust among colleagues and emphasizing an unwavering commitment to excellent patient care. Sharing principles and practical applications of these changes is important to optimize responses across the country and the world.

## Author Contributions

Study conception and design: Sosa, Shen, Conte, Wick  
Acquisition of data: Lancaster, Pierce, Shen, Wick  
Analysis and interpretation of data: Lancaster, Sammann, Pierce

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