CONCEPTS

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Protecting the emergency physician workforce during the coronavirus disease 2019 pandemic through precision scheduling at an academic tertiary care trauma center

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Abstract

The coronavirus disease 2019 (COVID-19) pandemic created new emergency physician staffing challenges. Emergency physicians may be taken out of the workforce because of respiratory symptoms or pending severe acute respiratory syndrome coronavirus 2 test results. Vulnerable emergency physician populations with increased risk of serious disease and death from COVID-19 include physicians at older ages; those with chronic medical conditions, including cardiac and pulmonary diseases and immunosuppression; and potentially pregnancy. We present our approach to planning for staffing issues through precision scheduling. We describe the actions taken to protect our vulnerable physicians and maximize our physician coverage. Measures include optimizing workforce; increasing backup call system; adjusting shifts based on patient arrival times, volume, and surge predictions; minimizing exposure to COVID-19 and reduce personal protective equipment use through telemedicine, huddles, and, creating lower risk emergency department care areas; and standardizing intubations to limit exposure.

KEYWORDS
coronavirus, COVID-19, emergency medicine, emergency service hospital, pandemics, telemedicine, workforce

1 | INTRODUCTION

On March 26, 2020, the United States became the epicenter for the coronavirus disease 2019 (COVID-19) pandemic with more reported cases than any other country in the world.[1] As different parts of the country prepare for the onset of the COVID-19 patient surge, in emergency department (ED) pandemic preparedness the impact on workplace staffing is a core issue. During a pandemic, it is estimated that a 40%–70% reduction of the workforce could occur.[2] The causes for this marked decrease in healthcare workers are multifactorial, including staff illness, personal and family care responsibilities, concern for family well-being, and personal safety.[3]

As frontline healthcare professionals, emergency physicians are at risk for COVID-19, the respiratory disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Healthcare professionals are at increased risk compared with the general population

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for COVID-19 from unprotected exposure or repeated exposure; risk can be mitigated with personal protective equipment (PPE) measures.[4] Prolonged exposure to patients with COVID-19 directly increased the risk of infection in healthcare workers.[5] With respiratory pandemics, emergency physicians are also at increased risk of transmission from aerosolizing procedures such as intubation.[6–8] Approximately 3.2% of patients with COVID-19 will require intubation from respiratory failure.[9] We present precision scheduling concepts and strategies that can be used to optimize the emergency physician workforce and minimize exposure to patients with COVID-19. We provide a general concept that is illustrated by a specific example from our ED followed by suggestions for precision scheduling in other ED settings.

2 | A LARGE PROPORTION OF EMERGENCY PHYSICIANS ARE AT RISK FOR COVID-19 COMPLICATIONS

A subpopulation of emergency physicians are at increased risk for serious disease and death from COVID-19 as a result of older age, comorbid conditions including being immunocompromised, and potentially pregnancy. Approximately 34.8% of emergency physicians in the United States are older than 55 years of age.[10] In the United States, among patients with COVID-19, fatality increased with age.[11] Adults with chronic medical conditions are at increased risk of severe disease from COVID-19. A meta-analysis demonstrated that hypertension, respiratory diseases such as chronic obstructive pulmonary disease, and cardiovascular disease were the leading comorbidities in severe cases of COVID-19 compared with non-severe cases.[12] Pregnant women have historically had increased risk from viral infections such as influenza, severe acute respiratory syndrome coronavirus 1, and Middle East respiratory syndrome coronavirus, but limited data are available for SARS-CoV-2.[13]

3 | CASE STUDY: ACADEMIC ED SETTING

Stanford Hospital is a teaching hospital and level 1 Adult and Pediatric Trauma Center in an urban area with an ED volume of 78,666 visits/year. All attending physician shifts are 8 hours in length. The adult ED has 68 beds and is divided into 7 work areas that open to coincide with the patient volume curve. Each adult ED area is staffed by 1 attending with 1–2 residents. The pediatric ED has 20 beds with 1 attending coverage 24 hours a day and double coverage with a second attending for 8 hours a day. The pediatric ED schedules 1–3 residents depending on the patient volume. A separate 8-bed ED observation unit is staffed by 1 attending with 1–2 advanced practice providers (APPs). An off-site, 8-bed walk-in clinic for low-acuity patients is staffed by 1 emergency attending that is open 8 hours a day from Monday through Friday.

As the community transmission rate of COVID-19 increased in the Northern California area, healthcare professionals with fever or respiratory symptoms were treated as a patient under investigation (PUI)

and tested for SARS-CoV-2 through occupational health, even those without a known exposure to a patient with COVID-19. The SARS-CoV-2 test could take between 12 hours to 4 days to result depending on the hospital testing capacity. While emergency physicians were waiting for test results, they were not allowed to work clinically. Emergency physicians diagnosed with COVID-19 were taken off the schedule for a minimum of 14 days or 7 days since last symptoms, whichever was longer.

On March 19, 2020, the governor of California ordered a "shelter in place," and EDs in California experienced a lower number of patient visits to the ED. At Stanford Hospital, before the pandemic in March 2019 the mean ED volume was 232 patients a day. In March 2020, the mean ED volume was 140 patients a day, and volume continued to decline to 50% of expected patient volume by the end of March. The percentage of ED patients who were tested for SARS-CoV-2 ranged from 42%–70%. From March 1, 2020 to April 22, 2020, 7%–10% of ED patients tested for SARS-CoV-2 were positive. From April 23, 2020 to June 17, 2020 the hospital's positive test rate for SARS-CoV-2 was 2%–4%, which was consistent with county-wide positivity data.[14,15] The percentage of ED patients who tested positive for SARS-CoV-2 and were admitted to the hospital ranged from 8%–46% with a mean and median of 27%. By temporarily adjusting and decreasing our ED staffing, we minimized the number of physicians exposed to patients with COVID-19.

4 | OPTIMIZING ADVANCED PRACTICE PROVIDERS

APPs in the hospital can be flexed to meet hospital and department needs. Before the epidemic, 1–2 APPs primarily staffed the ED observation unit. At that time, the hospital policy excluded PUIs and patients positive for SARS-CoV-2 from being admitted to the ED observation unit. The lower ED volume led to decreased census in the ED observation unit. The second APP was re-assigned to see low-acuity patients in the ED area that had the least number of emergency physician residents. APPs who typically work other parts of the hospital can be trained to work in areas in the hospital that are impacted by COVID-19 such as the ED and inpatient wards.

5 | OPTIMIZING EMERGENCY MEDICINE RESIDENT COVERAGE

Given the uncertainty of the COVID-19 surge, the emergency medicine residency made several adjustments to the resident staffing and curriculum. Similar to the attendings, emergency medicine residents with fever or respiratory symptoms regardless of exposure to patients with COVID-19 were considered PUIs and had to be tested by occupational health before returning to work. The emergency medicine residency activated the backup call resident 3 times more than usual during the first month of the pandemic. Resident staffing was decreased to minimize the number of physicians in the ED. Emergency medicine residents with cancelled shifts were placed on the backup call schedule.

Emergency medicine residents were reassigned to work in areas to maximize their skills. The emergency medicine residency program collaborated with other programs less affected by COVID-19. The pediatrics residency and pediatric emergency medicine fellowship covered shifts in the pediatric ED that were previously scheduled for emergency medicine residents. This allowed emergency medicine residents to be available for the anticipated surge of patients with COVID-19 in the adult ED.[16] When the predicted surge did not occur in our local area, the emergency medicine interns were given priority to restart their pediatric ED shifts as soon as possible, and senior emergency medicine residents were incorporated back into the pediatric ED schedule. This period lasted approximately 8–10 weeks of the 4-year emergency physician residency curriculum. In other settings impacted by increased volume of patients with COVID-19, residents from other residency programs may rotate in the ED or staff the inpatient wards and intensive care unit.

6 | CREATING A ROBUST EMERGENCY MEDICINE ATTENDING BACKUP CALL SYSTEM

With increased availability of SARS-CoV-2 testing, the recommendations for testing healthcare professionals broadened, which led to an increased number of emergency physicians considered to be PUIs who had to wait for a negative test to return back to work. To account for the increased backup call activations, it was necessary to build a robust backup call coverage system. Before the pandemic, we had a backup emergency attending physician scheduled each day to cover a 24-hour period. The backup call physician could be activated at any time and was expected to be within a 1-hour travel distance from the ED. To increase capacity, we asked each attending physician to give availability to cover 1 extra backup call from March to April, which resulted in all attending physicians being assigned 1 additional backup call day. This has proven useful as the average number of activations increased from once a week to about 1.6 per day. All attending physicians take backup calls throughout the year. If physicians were called in to work, they were compensated with 1.5 shift payout or credit. Increasing backup call coverage in other settings is also possible. In a single-coverage ED with 8-hour shifts, hours can be lengthened to cover an unexpected illness. For example, if a single-coverage ED with three 8-hour shifts has an afternoon shift sick call; the morning shift can stay 4 hours longer, and the overnight shift can come in 4 hours earlier to cover the afternoon shift. EDs that have an overlap between shifts may reduce the number of overlap hours or decreased double coverage depending on the patient volume.

7 | FLEXING SHIFTS TO MEET PATIENT VOLUME

Patient volume decreased significantly during the shelter in place, and the number of scheduled shifts were changed based on patient volume. To adjust the shifts, each week we examined hourly arrival and census curves broken down by Emergency Severity Index and by PUI status. The Emergency Severity Index is a 5-level triage tool to classify patients based on patient acuity and expected resource needs.[17] We are able to determine the resources needed each hour of the day based on patient arrivals. We used a 3-day moving average with a day-of-the-week modifier to project the next day's volume. Moving average is a way to analyze trends in data. For the day-of-the-week modifier, we looked at how much that day of the week varied from the average volume from the previous week and applied it to the moving average. In response to these data, we decreased our attending physician schedule from 20 shifts to 14 shifts during the lowest patient volume time period. We removed shifts dedicated to low-acuity areas, including the walk-in clinic, the second attending shift in the pediatric ED, and 1 float/resource shift and closed 1 of the ED areas completely. Physicians with cancelled shifts were placed on a sick-call schedule.

We used this information to remove an additional 1–2 shifts as needed for the next day. We examined the trends to decide when an area should open and modified the hours of the existing areas by opening an hour earlier to maximize the use of areas that had rooms appropriate for PUIs. As ED patient volume returns, we are using these strategies to re-open areas and adjust shifts accordingly. In other ED settings, a similar strategy may be used to adjust staffing as patient volume fluctuates.

8 | MINIMIZING EMERGENCY PHYSICIANS' EXPOSURE TO PATIENTS WITH COVID-19

For PUI or patients with COVID-19, we used telemedicine to minimized exposure to healthcare professionals and reduced PPE use. Many of the ED patient rooms had telemedicine capability through the television in the patient room, which was connected to the physician workstation computer. However, many rooms were not equipped with this type of telemedicine. We decided a new telemedicine system was needed, and it took 8 days to implement a new system using iPads and teleconferencing software. An iPad with teleconferencing software was assigned to a meeting room with an auto-answer feature and was placed in each patient room. The iPad gave a notification beep to the patient and a few seconds later connected to the virtual meeting room without the patient having to touch the iPad. A central iPad was located in the physician work area, which could call the iPad in each patient room.

Healthcare professionals who entered rooms with PUIs were minimized. In the ED, after a patient had been triaged, the triage nurse who had donned PPE brought the patient into the room and turned on the iPad or the telemedicine software on the room television screen. Residents and attending physicians used these telemedicine options to obtain the initial history from patients as well as update patients on laboratory and radiology results, next steps, and disposition plans without having to go into the room. Patients in isolation rooms only had one physician perform the physical examination portion of the visit. To distribute exposure and reduce PPE usage, the attending and resident alternated who performed the physical examination depending on the size of the team. If the resident performed the examination,

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the attending watched the resident perform the examination through telemedicine. In EDs that do not have access to iPads or teleconferencing services, another option would be to call the patient's cell phone, the room's intercom system, or use other free video chat services to talk with the patient to minimize the time healthcare professionals are spending in the room when direct patient contact is not required. Physicians and nurses used huddles to minimize the number of times healthcare professionals entered the room. During the huddles, team members discussed orders and potential next steps. Nurses also used telemedicine to communicate with patients or with staff when they needed an item that was not in the room (eg, tube for blood draw, ECG machine). Using these strategies, we estimate that we have reduced daily PPE use by 80–120 sets.

Lower risk areas can be created within the ED to reduce exposure to patients with COVID-19. Before the pandemic, all patients regardless of ESI level could be seen in any ED room including respiratory patients. During the pandemic, we clustered patients to create 2 lower risk areas for vulnerable emergency physicians. One area saw lower acuity patients without fever or respiratory symptoms. The second area used telemedicine exclusively to evaluate well-appearing patients who require SARS-CoV-2 testing and was considered a no-risk zone. The no-risk zone was a temporary drive-thru model that was set up in the garage adjacent to the ED for patients who were coming to the ED for SARS-CoV-2 testing only. Residents and attending physicians were asked to self-identify as higher risk for severe illness after COVID-19 exposure using the following criteria: age >65 years, chronic medical conditions or on immunosuppressant medications, or pregnancy. Physicians who were considered higher risk were given the option to be taken off the schedule or to be assigned to work in one of the lower risk areas of the ED. Physicians who were at higher risk for severe illness after COVID-19 exposure were excluded from performing intubations. EDs who are limited by physical space can explore expanding the ED outside of the normal footprint temporarily such as parking lots, waiting rooms, hallways near the ED, medical tents, and so on depending on the rules and regulations of the hospital and local public health department.

Standardizing aerosolizing procedures such as intubation reduced PPE use and minimized exposure to healthcare professionals. A COVID-19 airway intubation guideline was created by a multidisciplinary team from emergency medicine, anesthesiology, pulmonary medicine, critical care medicine, respiratory therapy, nursing, and surgery to standardize intubations for PUIs and patients with COVID-19 throughout the hospital. To allow time for healthcare professionals to don PPE, early awareness and notification of possible intubation is crucial. Intubations are to be performed by experienced physicians (attendings, fellows, or emergency physician residents in their final year of training). During intubation, the number of healthcare professionals in the room are limited to 2 physicians, 1 nurse, and 1 respiratory therapist. EDs should consider standardizing their approach and equipment to intubation to minimize healthcare professional exposure to patients with COVID-19.

9 | EMERGENCY PHYSICIAN AND APP POSITIVITY RATE

Since March 1, 2020, only 2 physicians (1.2%) were diagnosed with COVID-19 of 13 APPs, 62 emergency physician residents, and 88 emergency attending physicians and fellows. These 2 infections occurred in March during the first 3 weeks of the pandemic. The positivity rate in the 2 adjacent counties were 3%–5%.[14,15]

10 | SUMMARY OF PRECISION SCHEDULING STRATEGIES

The COVID-19 pandemic has created a unique situation and a need to optimize the emergency physician workforce. We present our approach to precision scheduling to maximize our physician coverage and reduce exposure. We optimized APPs, residents, and attending physician coverage in the ED and created a robust backup call system to cover physicians with COVID-19 or those unable to work as a result of testing. We adjusted the number of ED shifts and hours that areas were open based on the patient volume. We minimized exposure to COVID-19 and reduced PPE usage through telemedicine, huddles, and creating new lower risk areas in the ED. We asked physicians to self-identify as being higher risk for severe illness and rescheduled these physicians to work into lower risk areas. A COVID-19 intubation protocol reduced the number of healthcare professionals exposed during aerosolizing procedures. These strategies may be considered by other EDs during the COVID-19 pandemic.

CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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