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# Administration of Emergency Medicine

## EMERGENCY DEPARTMENT MANAGEMENT OF THE COVID-19 PANDEMIC

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**Abstract—Background:** Emergency departments (EDs) need to be prepared to manage crises and disasters in both the short term and the long term. The coronavirus disease 2019 (COVID-19) pandemic has necessitated a rapid overhaul of several aspects of ED operations in preparation for a sustained response. **Objective:** We present the management of the COVID-19 crisis in 3 EDs (1 large academic site and 2 community sites) within the same health care system. **Discussion:** Aspects of ED throughput, including patient screening, patient room placement, and disposition are reviewed, along with departmental communication procedures and staffing models. Visitor policies are also discussed. Special considerations are given to airway management and the care of psychiatric patients. Brief guidance around the use of personal protective equipment is also included. **Conclusions:** A crisis like the COVID-19 pandemic requires careful planning to facilitate urgent restructuring of many aspects of an ED. By sharing our departments' responses to the COVID-19 pandemic, we hope other departments can better prepare for this crisis and the next. © 2020 Elsevier Inc. All rights reserved.

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## INTRODUCTION

Emergency departments (EDs) need to be prepared to manage crises and disasters in both the short term and the long term (1). Unlike events that merit an immediate short-term response (e.g., weather emergencies or mass shootings), infectious outbreaks, including the coronavirus disease 2019 (COVID-19) pandemic, require a prolonged, sustainable response. According to the World Health Organization's hospital emergency response checklist, several critical actions should be prioritized to support a safe and effective disaster response. These include swift adaptation to increased demands, effective use of limited resources, and maintenance of a safe environment for health care workers through a well-coordinated and communicated operational effort (2). Often, an incident command system for each hospital or health care system is used to coordinate the multipronged response required for a crisis or disaster of large magnitude. A similar structure can be used on a departmental level to coordinate the response by one ED or by several EDs within the same health care system (1).

We present the management of the COVID-19 crisis in 3 EDs within the same health care system: an academic level 1 trauma center (academic site), an urban community affiliate (community site 1), and a suburban affiliate

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(community site 2). The academic site has an annual census of approximately 95,000 visits. Community sites 1 and 2 see, respectively, approximately 47,000 and 40,000 visits annually. While our management plans were coordinated across all 3 EDs, implementation at each site varied slightly because of differences in size, staffing, and available resources. Key differences between the main academic site and the community sites are highlighted as academic and community subdivisions in the following sections. We also note the outcome of each item on the management plan as a success or failure within our department.

## DISCUSSION

### *Communication*

During a crisis, transparent, accurate, and timely information exchange is critical to establish trust in leadership, ensure safe and informed decision making, and guarantee effective cooperation between the operational leadership team and those on the front lines in the ED. As the COVID-19 pandemic crisis began to unfold, key members of the ED operations leadership team came together to formulate a plan to provide regular updates to the staff in the face of an ever-evolving situation. We chose to create an ED operations framework document for each campus that was used to disseminate site-specific information pertaining to patient screening, room placement, testing, disposition, personal protective equipment (PPE) use, and staff exposures.

Because the situation was fluid, operational changes often occurred daily at each campus. We convened on a daily ED operations call with representatives from the nursing and physician leadership teams of each campus. Any agreed-upon changes were highlighted in red on the site-specific ED operation documents. The updated ED operations documents were disseminated to the entire staff via email and posted on the hospital SharePoint site which is available on the hospital employee website and via a direct link from the hospital electronic medical record.

In addition to the daily ED operations calls, there was also an ED steering committee that met once a week to discuss issues outside the ED and their impact on ED operations. The ED steering committee included members of hospital medicine, infection control, the hospital PPE task force, and our transport team. Recognizing that some staff members may have questions or concerns not immediately addressed by the ED operations documents, an ED leadership team call schedule was created and posted online. According to the call schedule, a member of each site-specific nursing and physician leadership

team was listed and available to provide assistance 24 h a day, 7 days a week.

*Outcome.* The ED frameworks and operations and steering committee calls were successful. As the pandemic progressed and departmental changes stabilized, the operations calls were changed from daily to weekly, and the steering committee calls were changed to every other week, and ultimately disbanded. The ED leadership team call schedule was found to put an additional strain on departmental leaders, who were already stretched thin. To preserve the wellness of the operational leaders, the call schedule was foregone after a few weeks.

### *Screening*

As the COVID-19 pandemic spread to the United States, a screening protocol to identify patients at risk of having COVID-19 was created. Based on guidance from the Centers for Disease Control and Prevention, an initial set of questions was added to our existing ED triage (3). The first iteration of our screening tool asked about fever, cough, shortness of breath, international travel, and contact with a person known or suspected to have COVID-19. As the pandemic grew, international travel was removed from the screening questions. In later versions, symptomatic questions were adjusted to include body aches, flu-like symptoms, and loss of smell or taste. The same screening protocol was used at all sites.

*Outcome.* The screening program was successful at identifying patients who were at risk for COVID-19 in the early stages of the pandemic. However, over time, it was found that many other symptoms could be indicative of COVID-19 infection, and so, even though the screening protocol remained in place, all patients were ultimately considered to be at risk for COVID-19.

### *Patient Room Placement*

*Academic site.* Our main campus ED, before COVID-19, was 50 treatment spaces. Of these spaces, 21 were closed door rooms and the remainder were separated by curtains. We recognized the need to increase the number of fully enclosed rooms to diminish aerosolization between treatment spaces. In a phased approach that minimized the impact to ongoing ED operations, we installed barriers of thick corrugated plastic with zippered doors, each with a translucent area of plastic to be able to monitor patients from the adjacent nurses' station. Eight existing negative pressure rooms in the ED were designated for sicker respiratory patients on arrival, who were more likely to need aerosol-generating procedures, such as

high-flow nasal cannula, bilevel positive airway pressure, or intubation.

A 30-ft × 50-ft tent was rented and placed outside the ambulance and adjacent walk-in entrances of the ED. A nurse was positioned outside those entrances during peak arrival times, directing any stable patients with respiratory complaints or fever to be triaged in the tent. The tent was staffed by a triage nurse and a physician assistant or nurse practitioner to perform Emergency Medical Treatment and Labor Act–compliant medical screening examinations. Those without risk factors for severe illness and not requiring treatment, without labored breathing or exertional hypoxia, were discharged home from the tent with instructions to self-isolate and with information on how to arrange outpatient viral testing. Patients in the tent who were found to be stable but needing medication or diagnostics (e.g., imaging) were escorted through a separate exit and directly into a repurposed minor care area with closed rooms for treatment. This allowed minor respiratory cases to be cohorted away from the rest of the ED.

For sicker patients, in particular those arriving in cardiac arrest, we created 2 additional resuscitation bays by repurposing an internal waiting room and a larger treatment room. Because of aerosol-generating procedures such as cardiopulmonary resuscitation and endotracheal intubation being performed in these rooms, the supplies maintained in the room were pared down to a minimum, with code carts and airway supply boxes positioned just outside the doors. A protocol was developed by which the minimum necessary staff would enter the room and supplies would be handed in from outside the door. An automated cardiopulmonary resuscitation device was used to obviate the need for an additional staff member to do compressions.

*Community sites.* Community site 1 had 19 treatment spaces before the COVID-19 pandemic, all of which were closed door rooms. Three rooms were negative pressure rooms, and were designated for sicker respiratory patients and those who required aerosol-generating procedures. The largest of the negative pressure rooms was repurposed as the resuscitation bay because the existing one did not have negative pressure capabilities.

In preparation for a surge of patients with COVID-19, additional treatment spaces were created within the ED and in areas proximal to the ED. Within the ED, an area that was previously used as an extension of triage, consisting of 3 chairs, was equipped with a stretcher and enclosed with clear plastic with zippered closures. The family waiting room was also converted to a treatment space. Outside of the ED proper, new treatment spaces were created in the preadmissions testing area and in a lobby conference room, using medical supplies

from outpatient practices that were not operating during the pandemic. In the preadmissions testing area, the waiting room and 2 office spaces were replaced with 6 new additional ED treatment spaces. The registration staff that had previously occupied that area was temporarily relocated to allow for the ED expansion. The lobby conference room was repurposed to 7 additional ED treatment spaces, which were equipped to care for low acuity, non-COVID patients, who previously would have been seen in a minor care or fast-track space.

In lieu of a tent, a temporary structure was constructed just outside of the ambulance entrance at community site 1. To maintain linear flow through the ED, triage was relocated to that structure during hours it was operational. All patients, regardless of complaint, were then triaged in the new structure before entering the ED. Initially, the new structure was also staffed with a physician assistant or nurse practitioner, in order to screen the lowest risk patients away, with instructions to self-isolate and arrange outpatient testing, as was done at the tent located at the main ED. However, as low-acuity COVID volume declined, these providers were redeployed from the screening structure to additional internal treatment spaces.

Before the COVID-19 pandemic, community site 2 also had 19 treatment spaces. The footprint lent itself to physically separating the respiratory ED from the non-respiratory ED. The fast track area of the ED, which was comprised of 5 closed door rooms, was converted into the respiratory ED. The internal waiting room located in the fast track space was converted into 2 additional treatment spaces for the respiratory ED. An additional 5 closed door rooms adjacent to the fast track could be flexed to the respiratory ED if the volume of respiratory patients warranted this. Two of these were negative pressure rooms. Patients requiring aerosol-generating procedures were preferentially placed in these treatment spaces. The waiting room was divided into a respiratory section and a nonrespiratory section, each with a separate entrance into the respective respiratory and nonrespiratory EDs. At community site 2, a tent was similarly located outside the ambulance entrance. The process used at the academic center was replicated there.

*Outcome.* The changes to the interior of the 3 EDs successfully allowed for treatment of more patients in a safer manner. However, these changes were found to be less effective over time, as COVID incidence grew and atypical presentations were identified. We did not discard this plan, though, as it was found to have some benefits, despite less than perfect capture.

The volume of patients that were evaluated in the tents placed at the academic site and community site 2 was

lower than anticipated. On average 18 patients per day were screened through the tent at the academic site, and 2 were seen in the tent each day at community site 2. While the tents remain at each site, as the possibility of a recurrent wave of infections exists, they are not currently in use. The temporary structure constructed outside of community site 1 continues to be used for triage of all patients, and plans for permanent construction to expand the ED into the temporary structure are in development.

### Staffing

*Academic site.* In an effort to minimize staff exposures, we created a respiratory ED team and a nonrespiratory ED team. We quickly found that surges of respiratory patients, as well as nonrespiratory presentations of COVID (e.g., patients with gastrointestinal manifestations or generalized weakness) rendered this distinction somewhat moot. However, this did help to cohort the sicker group of respiratory cases (i.e., those ultimately requiring ventilatory support) on one team.

Based on data from Asia and Europe on the increased morbidity and mortality for persons  $\geq 60$  years of age or patients with diabetes, immunocompromise, or cardiopulmonary comorbidities, we created a list of “accommodated ED providers” who met these criteria or who lived with immunocompromised family at home. These providers were allowed to self-assign to the nonrespiratory ED team, though as noted it became impossible to absolutely limit their exposure to patients with COVID as the incidence grew and more patients were incidentally diagnosed during workups for other pathology.

Cancellation of elective procedures and restrictions on ambulatory visits created a pool of available subspecialty providers. In anticipation of a large surge in COVID cases, and the possibility of a large number of ED staff becoming ill or quarantined, we created 2 “pods” staffed by non-ED providers: a surgery pod staffed by 2 surgical residents and an attending surgeon, and a cardiology pod staffed by an advanced practice provider and an attending cardiologist. These pods were created in the interventional radiology holding area adjacent to the ED, to allow for rapid triage of appropriate patients to those areas.

*Community sites.* Community site 2 also used a pod model similar to that used in the academic ED. The pre-admission testing area was converted into a 7-bed treatment area staffed by redeployed nursing as well as surgical and cardiology physicians. Community site 1 used non-ED providers in a different manner. Given space constraints, no new pod areas were created, but providers from a hospital-affiliated urgent care, family medicine practice, and hospital-based outpatient departments

were instead incorporated into existing ED staffing patterns. At both community sites, where there was no formal division into respiratory and nonrespiratory teams, those providers who were not listed as “accommodated ED providers” were encouraged to preferentially see the COVID-19 patients, instead of their at-risk colleagues.

*Outcome.* Overall, our health care system experienced a contraction of non-COVID patient volume through the ED. ED census decreased by about 30%, with fewer patient visits across all ESI levels. Our admission rate increased by one-third (22–29%) during the peak of COVID in our area. The academic hospital shifted most inpatient staff to a building designated for the care of confirmed or suspected COVID patients, which represented the majority (59%) of admissions in the month of April.

The specialty pods also saw lower than expected volumes. At the academic site, the surgical pod averaged 7 patients per day and the cardiology pod averaged 3 patients per day. At community site 2, 2 patients were seen through the pod, on average. After May 1, we closed the specialty pods for lack of significant patient volume to support them.

While the overall decrease in patient volumes limited the overall utilization of the tent and the specialty pods, these were an important proof of concept. It should also be noted that averages were made lower by the introduction of these initiatives well before COVID volumes dictated a need. This was important to identify barriers to successful implementation and for staff to learn and gain comfort with these processes before resources were truly overwhelmed. We feel confident now that in the event of a second surge, we could successfully reimplement the tent and pod model within a matter of hours.

### Disposition

Algorithms to help guide clinical decisions and dispositions were developed in conjunction with the pulmonology team in the Department of Thoracic Medicine and Surgery, and with the Division of Hospital Medicine in the Department of Medicine. The algorithms risk-stratified patients presenting to the ED based on symptoms, imaging results, and degree of respiratory support required. Admissions were further stratified to different locations within the health care system, different care teams, and different levels of isolation. A standard admission order set was created to expedite care for those patients that were admitted. The order set was inclusive of laboratory testing, including infectious and coagulation markers, imaging, specimen collection, and isolation precautions.

For those patients not requiring admission, discharge instructions were developed in several languages for both high and low risk cohorts. In addition to information on “typical” symptoms of COVID (fever, cough, and shortness of breath), the low-risk discharge instructions included information on hand hygiene and social distancing. The high-risk discharge instructions provided more guidance on quarantine and isolation. Once developed, instructions on how to access a free web-based symptom tracking tool were added. To reduce the risk of virus transmission, patients no longer had to sign their discharge papers. Instead, a verbal acknowledgment of understanding and reception of instructions was documented by the bedside nurse.

Portable fingertip pulse oximeters for home use were purchased for distribution. Initially, given a limited supply, these devices were given to discharged patients with risk factors for decompensation ( $\geq 50$  years of age, diabetes, chronic heart or lung disease, or immunocompromised) with a borderline oxygen saturation. As more devices were obtained despite increased national demand, the criteria for dispensing them was relaxed, so that more patients could be given an opportunity to monitor their illness.

*Outcome.* The admission algorithms and order set were successful and helped reduce variability in practice and standardize care of the patients with COVID-19 in the ED.

#### *Visitors*

Before COVID-19, each ED patient was allowed 2 visitors, except in certain circumstances, such as critical illness, end-of-life care, or minors. At all 3 sites, visitor restrictions were put in place in the early stages of the COVID-19 pandemic. Initially, patients were limited to 1 visitor each. Ultimately, that was reduced to no visitors, with the exception of extenuating circumstances, which included critical illness, altered mental status, medical power of attorney, assistance with interpretation, patients with special needs, and minors.

*Outcome.* The visitor policy changes were understood by patients and well-received by staff.

#### *Airway Management*

Efforts were made to limit aerosolization in all but the most necessary circumstances. Patients who would otherwise have been treated with nebulized bronchodilators were treated with inhalers and spacers, which had been shown in the literature to be noninferior (4). Patients were typically managed on the minimal necessary venti-

latory support; noninvasive positive pressure (continuous positive airway pressure/bilevel positive airway pressure) was reserved for those who could not be managed by high-flow nasal cannula. A guideline on awake proning as circulated to staff as support for the practice grew as a way of delaying or preventing the need for intubation.

Emergency medical services protocols were altered for patients to have supraglottic iGel airways placed in the field; these were left in position upon arrival until return of spontaneous circulation was obtained unless ventilation was inadequate. For endotracheal intubation, video laryngoscopy with either a C-MAC (Karl Storz SE and Co. KG, Tuttlingen, Germany) or GlideScope (Verathon, Inc., Bothell, WA) device was recommended as a first approach. Some physicians opted to use an acrylic airway barrier box to limit exposure of the intubating physician to secretions. Upon intubation, viral and bacterial filters were placed on the circuit.

*Outcome.* Aerosolizing procedures were successfully limited. Logistically, more patients had to be moved from one treatment space to another, to ensure that aerosolizing procedures took place in negative pressure rooms when possible.

#### *PPE*

PPE at all 3 sites followed Centers for Disease Control and Prevention guidelines. Special enhanced droplet precautions (gown, gloves, surgical mask, and eye protection) were followed for patients with symptoms concerning for COVID. If an aerosol-generating procedure was required, special enhanced airborne precautions (gown, gloves, N-95 or powered air purifying respirator, and eye protection) were used. Patients were provided a surgical mask. To conserve the supply of PPE, distribution of surgical masks occurred behind locked doors after a temperature screening.

*Outcome.* The distribution of PPE changed during the pandemic, based both on Centers for Disease Control and Prevention guidance and available supply.

#### *Psychiatric Patients*

All 3 sites have inpatient psychiatric services and the option of transferring patients with psychiatric emergencies to the crisis response center (CRC) located at community site 1. However, before the pandemic, in-person ED consultation was not available at any site. In order to minimize transfers to the CRC, a telepsych process was established.

Any psychiatric patient who had a positive COVID screen, defined as fever, shortness of breath, new onset

persistent cough, positive test result, recent travel, or known exposure, was not transferred to the CRC for evaluation. For any patient at academic site or community site 2 with a psychiatric chief complaint, the ED provider called the psychiatrist working in the CRC. Once the psychiatrist reviewed the patient's chart, a telepsych consult was arranged via iPads with FaceTime capabilities. If the psychiatrist deemed that involuntary commitment was necessary, the patient was transferred to the CRC only if the COVID screen was negative. Patients with a positive COVID screen who required involuntary commitment were admitted for inpatient psychiatric consultation. Patients evaluated via telepsych who were determined to not require involuntary commitment were discharged to quarantine at home if their COVID screen was negative. Any patient not requiring involuntary commitment who had a positive COVID screen, and was unable to safely quarantine (i.e., resided in a shelter or group home) was admitted.

Patients requesting evaluation for substance use disorder who were at risk for alcohol or benzodiazepine withdrawal were similarly screened for COVID-19 symptoms and only those with negative screens were transferred to the CRC. Patients not at risk for alcohol or benzodiazepine withdrawal were discharged to quarantine at home with outpatient resources.

*Outcome.* The telepsych program had minimal success because of staffing availability at the CRC. An attending psychiatrist was only available for telepsych consults during weekdays, and therefore, patients presenting to the ED after hours or on weekends could not participate in the telepsych program.

## CONCLUSIONS

A crisis like the COVID-19 pandemic requires careful planning to facilitate urgent restructuring of many aspects of an ED. Throughput protocols and workflows must be restructured to allow for screening of at-risk patients and safe and expedited dispositions of all patients, while maintaining staff safety. Often, physical restructuring of the department must be done with ingenuity to optimize and expand treatment capabilities. Efforts must be made to best use providers who are unfamiliar with the ED context. By sharing our departments' responses to the COVID-19 pandemic, we hope other departments can better prepare for this crisis and the next.

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