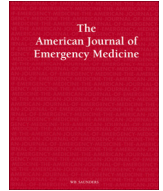




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Surge activation by the emergency department for COVID-19

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ABSTRACT

In March 2020, the American College of Emergency Physicians (ACEP) published a national strategic plan for COVID-19, which provides general guidelines yet leaves logistical details for institutions to determine. Key capabilities from this plan provided a crucial foundation for a 16-day Emergency Department (ED) surge planning process at one pediatric institution. This paper describes critical milestones and lessons learned during this brief period, including derivation of criteria for ED surge activation, a full-scale surge drill, and the resultant ED surge protocol. The framework of real-time evaluation was used throughout the planning process and involved constant and iterative synthesis of real-time feedback from multidisciplinary stakeholders for responsive decision-making. Ultimately, the objective of this paper is to provide timely and readily actionable information to other institutions seeking guidance to apply the ACEP strategic plan for COVID-19.

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1. Introduction

On March 13, 2020, the Emergency Department (ED) at Children's Hospital Los Angeles conducted a multidisciplinary surge drill to prepare for possible influxes of patients amid the COVID-19 pandemic. This drill adhered to the national strategic plan for COVID-19 [1], recently published by the American College of Emergency Physicians (ACEP), which provides general guidelines yet leaves logistical details for institutions to determine. We hereby describe a 16-day surge planning process, including the full-scale surge drill and commensurate ED surge protocol. The framework of real-time evaluation was used throughout, which involves constant and iterative synthesis of various real-time data sources for responsive decision-making with attention to context [2–4]. In light of emerging COVID-19 hotspots around the United States and world [5], we hope our paper, including a detailed description of surge criteria and an accompanying logic model (Fig. 1), provides timely and readily actionable information for other institutions to prepare for similar circumstances.

2. Early recognition of crisis and mobilization of stakeholders

On February 26, 2020, the Associate ED Director (DRL) e-mailed the ED Director and a senior Pediatric Emergency Medicine Fellow (BSG) with

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expertise in disaster preparedness to ask for urgent identification and mobilization of key stakeholder groups across the hospital. Based on data at the time from Europe and China indicating that COVID-19 most acutely affects geriatric populations, this e-mail recognized that capacity may be more problematic than disease severity at pediatric institutions. A core ED team was assembled within 36 h of the e-mail; members consisted of ED physicians, nursing and registration leaders, who met in person to discuss the beginnings of a COVID-19 ED patient surge plan.

3. Application of the COVID-19 National Strategic Plan

Prior to reaching out to stakeholders outside of the ED, key capabilities from ACEP's national strategic plan for COVID-19 were identified as core objectives of the evolving surge activation drill and plans. The capabilities selected included:

- “Training and exercise program for all involved personnel”
- “Enhanced facility security and crowd management”
- “Alternate locations and staffing for triage and medical screening exams”
- “Configuration of ED waiting rooms for distancing to the degree possible”
- “Environmental decontamination capability”
- “Appropriate PPE for health care staff”

These particular capabilities were selected as they directly affect ED operations. Furthermore, the core ED team members were

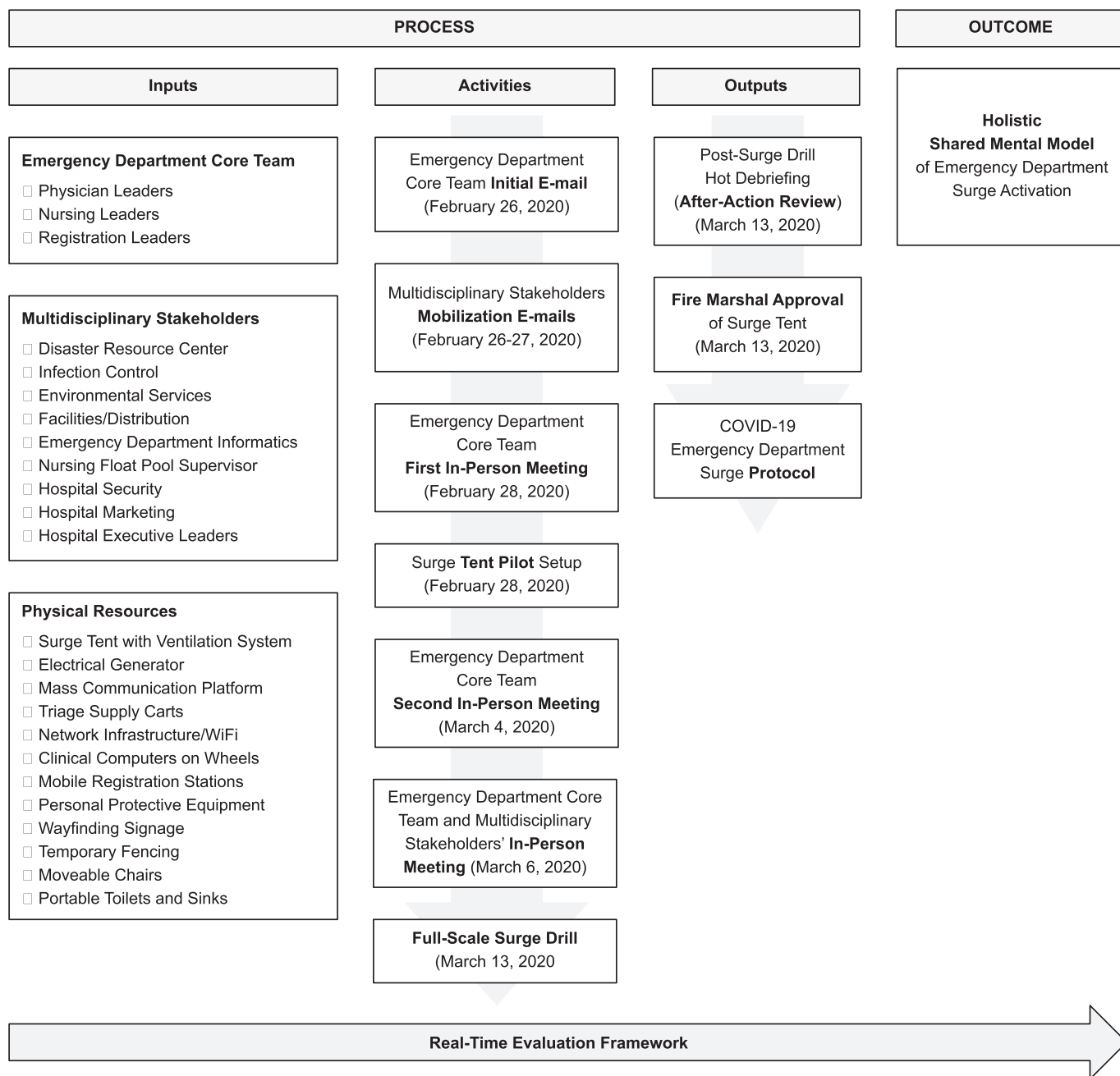


Fig. 1. Logic model of COVID-19 ED surge drill planning.

well-positioned to fulfill these core objectives because of their deep understanding of ED workflow intricacies.

4. Emergency department surge activation criteria

Early in the surge-planning process, the core ED team observed that the hospital's surge plan designated metrics such as inpatient and operating room census as triggers; since it is possible for there to be a significant ED patient surge for quite some time before these inpatient metrics would be impacted, specific criteria for bottom-up surge activation had to be designated. These criteria included: sustained daily ED census >400 patients for 3 days in a row, or a daily census >375 for 3 days in a row with >60% low acuity patients. These numbers were chosen based on existing metrics [6,7] illustrating that, given our

current processes and workflow at the time, daily census numbers exceeding roughly 375–400 per day result in a significant increase in our average length of stay and left-without-being-seen rate. The decision to wait for activation until these census numbers are sustained for 3 days was made to ensure that the increase was a trend and not an artifact. That said, it should be noted that these metrics should be continuously revisited to ensure their relevance to current circumstances and clinical workflow.

5. Major surge planning milestones

The major milestones in preparation for the surge drill were two meetings, one with core ED team members on March 4, 2020 and

another with the core team and multidisciplinary stakeholders on March 6, 2020. Topics discussed were:

- Emergency Department surge activation criteria
- Personal Protective Equipment
- Erecting an emergency screening tent
- Workflow logistics for the alternate care site
- Surge supplies and equipment
- Communicating about COVID-19 with families

Furthermore, the March 6th meeting secured buy-in from each group for the emergency surge activation criteria as well as their team's participation in the March 13th surge drill. Consistent with the real-time evaluation framework, team leaders were invited to weigh in on the logistics of the alternate care site throughout the meeting. By the end, stakeholders came away with an *initial* mental model of the planned surge drill – the *final* holistic mental model would manifest during the actual drill.

6. Surge drill

On March 13, 2020 at 07:00, stakeholders convened with key observers to begin the full-scale surge drill with mock patients. Consistent with the real-time evaluation framework, both participants and observers provided feedback throughout the drill to enable real-time corrections. Two physician leaders oversaw the feedback mechanism in real-time during the drill; one physician was in charge of gathering continuous feedback from all drill participants and the other physician executed the identified changes as needed. These corrections promoted a holistic shared mental model of what the surge activation as a whole would look like under anticipated circumstances.

7. Post-surge drill

An after-action review immediately followed the surge drill for reflections and discussions to improve the hospital surge protocol. By the afternoon, the Los Angeles City Fire Marshal visited the hospital and approved the tent's position in the parking lot. A follow-up e-mail was ultimately sent to all stakeholders with action items.

8. Emergency department surge protocol

Following the surge drill and after-action review, the ED surge protocol was drafted to guide future operations, as described subsequently.

In the event that the criteria for activation of the ED surge protocol are met, the hospital's mass communication platform will be utilized to notify all stakeholders of surge activation. A tent serving as an alternate care site for medical screening exams for low acuity respiratory patients will next be erected in the parking lot adjacent to the ED entrance. A walkway designated with temporary orange fencing for safety will lead patients to the screening station staffed by a nurse, technician and registration personnel. Patients at the screening station will be assessed and masked by a nurse while a technician obtains pulse oximetry and heart rate values. Inclusion criteria to be seen in the alternate care site will be: age ≥ 3 months, respiratory symptoms, fever < 5 days, pulse oximetry value $\geq 95\%$, and no chronic systemic conditions.

After screening, patients will be sent either to the tent waiting area (if meets inclusion criteria) or to the ED waiting room for standard triage (if does not meet tent criteria). Registration staff will immediately begin to register patients designated to the tent, which will enable real-time electronic tracking of these patients. To curb entry into the hospital building and allow for strict cohorting of low acuity respiratory patients, the alternate waiting area will include portable toilets, sinks and hand sanitizer dispensers. Security officers will be present near

the tent and alternate waiting area to enforce public safety, crowd control, and physical distancing.

The tent will be divided into 4 treatment spaces, each numerically identified. Once a space becomes available, a technician who is stationed just outside of the tent with a computer on wheels will direct a patient to the space and then enter the space number into the electronic tracking board. The patient will thereafter be seen by the physician and the bedside nurse.

9. Sustainability

To ensure that the critical elements of the surge policy are kept up to date even beyond the COVID-19 pandemic, the newly-appointed ED Director of Disaster Preparedness (BSG) will ensure that surge drills occur with regularity throughout the year. Having a dedicated ED disaster lead will allow for ongoing collaboration with hospital stakeholders in between drills, and foster opportunities for continued improvement of policy and operations.

10. Conclusions

The key capabilities from ACEP's national strategic plan for COVID-19 provided a crucial foundation for our ED surge planning process. These general guidelines gave rise to more granular logistical details that were specific to our institution.

Planning and implementing our surge drill highlighted the complexities of duplicating the ED infrastructure and workflow within a hospital parking lot. Herculean, multidisciplinary efforts were required for the assembly of physical resources and the creation of a new system for safe and optimal patient flow. Regardless of whether the hospital eventually sees a surge of pediatric patients due to COVID-19, the planning and activation milestones we have described may be applicable in the event of a natural disaster or mass casualty incident, wherein the ED would also be inundated with patients.

The underlying logic that supported the 16-day planning period leading up to the surge drill and the drill itself came from the framework of real-time evaluation, such that real-time feedback from various stakeholders was constantly and iteratively integrated into responsive decision-making. Without multidisciplinary responsiveness, adaptability, commitment and follow-through, the planning process would not have resulted in a holistic shared mental model of what an ED-activated surge should look like.

The iterative nature of the drill and the closed-loop communication that took place throughout it were, as one emergency physician noted, much like running a resuscitation code. Thus, although this pandemic is novel, the mindset with which to approach it may draw from prior, familiar experiences.

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CRedit authorship contribution statement

Anita R. Schmidt: Conceptualization, Methodology, Investigation, Data curation, Visualization, Writing - original draft, Writing - review & editing. Phung K. Pham: Conceptualization, Methodology, Investigation, Data curation, Visualization, Writing - original draft, Writing - review & editing. Deborah R. Liu: Conceptualization, Resources, Writing - review & editing, Supervision. Bradley

S. Goldberg: Conceptualization, Resources, Writing - review & editing, Supervision, Project administration.

Declaration of Competing Interest

No conflicts of interest, financial or otherwise, to disclose.

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