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Room to Maneuver: Implementation of a Pediatric Emergency External Surge Tent during the COVID-19 Pandemic

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Abstract

Objective: We aim to describe the process development and utility of a tent outside a pediatric emergency department (ED) to evaluate low-acuity pediatric patients during a pandemic state.

Methods: We utilized a pandemic surge tent outside of a pediatric ED during the COVID-19 pandemic in March 2020-April 2020 to evaluate and discharge low acuity pediatric patients. A nurse-driven protocol was developed to triage appropriate patients to the surge tent; those with symptoms that could be consistent with the pandemic virus, ESI triage level 4 or 5 and those who could be safely evaluated in the tent. Patient volumes in the pandemic surge tent were tracked in comparison to daily ED census.

Results: The pandemic surge tent was open for a two-week period at the end of March and beginning of April 2020. Total ED volumes, based on average daily census, were decreased to 40% of normal when compared to similar two-week periods averaged over the prior three years (2017-2019). The pandemic surge tent was used to see 5.4% of the total ED volume for the days that it was in use. Infection control measures for patient and staff safety were maximized via patient cohorting in the tent. Due to low overall patient volumes, no additional ED staff was needed to operationalize the pandemic surge tent.

Conclusion: We were effectively able to use an external surge tent to evaluate and discharge appropriate patients during a pandemic state. The surge tent was effective in limiting infection risks inside the main ED, protecting vulnerable pediatric patients, and preserving essential ED staff. Overall low patient volumes did not necessitate further use of the pandemic surge tent. The initial trial period prepared the department for future use should there be a surge of infectious patients.

Keywords: Pandemic; Tent; External surge tent; Pediatrics; Emergency; COVID-19; Coronavirus

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Introduction

The novel COVID-19 virus first arrived in the United Sates in January 2020. Initially, the impact that the virus would have on pediatric patients in the United States was unclear. Early in the pandemic, it was also unclear how the virus may affect pediatric emergency medicine providers with significant concern that many providers may become infected. Historically, the H1N1 pandemic challenged many pediatric EDs in already busy winter months. Some institutions utilized mobile ED surge tents to screen patients providing cost effective care [1]. Our institution had a large surge of patients during the H1N1 pandemic, but did not extend to use a surge tent during that time. There was concern that COVID-19 could have similar effects on our system as the H1N1 pandemic did several years earlier.

In addition, cohorting patients in order to limit infectious exposures to staff and other patients were of high concern during the initial response to the COVID-19 pandemic. An external tent that allows for evaluation and disposition of patients aids greatly in cohorting patients which was an added benefit to the extra space provided by the tent.

The first patients infected with COVID-19 in the United States were noted in January 2020. By March 2020, all 50 states reported cases of COVID-19. Local hospitals began admitting sick adult patients infected with the virus on March 10, 2020, at the same time one of our own staff members developed symptoms consistent with the virus, and ultimately tested positive for SARS-CoV-2. This heightened our concerns that multiple ED providers may become ill with the virus and ultimately challenge our staffing and ability to care for a large influx of patients. In response to an anticipated spike in infectious patients, our institution cancelled elective surgeries around this time as well. They also closed our smaller, satellite urgent care sites and satellite clinics in an effort to centralize staff and services to one location in an effort to minimize exposures to the virus and preserve PPE, which also increased the availability of displaced staff and providers to support a pandemic surge tent. There was prior knowledge that, in general, US health systems are underprepared for infectious pandemics [2,3]. Based on the reports of rapid spread in other countries, prior experiences with similar outbreaks such as H1N1 [4] and staff already infected, we decided to prepare for a significant influx of infected patients and mobilized an external pandemic surge tent.

Importance

The initial objective of operationalizing a pandemic surge tent was to reduce wait times in the event of a large influx of patients. Surge tents provide a space where a large volume of low-acuity patients can be seen efficiently and likely dispositioned without entering the main ED. The secondary goal was to cohort infectious patients, with the goal of minimizing exposure for other patients, especially high-risk patients commonly seen in a tertiary children's ED, and staff inside the main ED. We also aimed to minimize the waste of personal protective equipment which was in short supply. Finally, we aimed to create a process that mimicked our typical patient flow practice so that the practice could be mobilized quickly in this pandemic and as needed in the future. At the time of the planned tent deployment, testing availability was limited to known contacts or "high-risk contact" who required inpatient care and thus not a stated function of the tent. This is a descriptive study that also recognizes the value of this exercise as it pertains to future use in disaster or pandemic states.

Goals of this study

The goal of this study is to describe the operational change implemented to effectively use an external surge tent during a global viral pandemic in the pediatric ED setting. The primary aim of the operational change was to have a location separate from the main ED where low-acuity patients could be evaluated rapidly without significant need for secondary resources and dispositioned to home. Secondary goals included cohorting of infectious patients and creating a process that could easily be repeated at our institution in the future and could be mimicked elsewhere if desired.

Materials and Methods

Theoretical model of the problem

During the initial stages of the COVID-19 pandemic in our area it was unclear how fast or extensive the spread of the disease would be. Reports from prior epidemic "hot spots" suggested that high rates of infection were seen in health care providers and in ED staff in particular, which were higher than the general population. Initially the spread in our local area was exponential and fast, in the few weeks after the initial exponential spread, a stay-at-home order was issued by the state governor and the spread became linear.

The pandemic surge tent, as a possible expansion of the pediatric ED, was designed to select and evaluate the low acuity infectious patients outside the main ED. This could serve in management of surge volumes if a high volume state occurred, minimize unnecessary contact between patients with COVID-19 infection and high-risk pediatric patients and medical staff, as well as decrease the contamination load of the main ED. At the time of the tent use, it was assumed that any patient with respiratory symptoms may have been a COVID-19 carrier.

Design

This was a descriptive, quality improvement project describing the development of a process to effectively use an external surge tent during a global viral pandemic in the pediatric ED setting. Patient's presenting for evaluation to the pediatric ED from March 30 to April 11, 2020 were included in the evaluation.

Setting and selection of participants

Our center is a pediatric tertiary care, referral center in a large metropolitan area with an extended geographic referral area. The pediatric ED is a 47 bed ED with an additional 5 rooms which serve as a quick evaluation pod for low acuity patients who require minimal intervention. At the beginning of the pandemic tent operation design our state had become a national hotspot with exponential community spread. The first known case was detected on March 5, 2020; by March 15, 2020 there were 176 known cases with 4 deaths.

At that time, it was expected that a large surge of pediatric and young adult patients with mild symptoms of the COVID-19 illness as well as other respiratory illnesses would present to our ED for care. The primary objective of the pandemic surge tent was to redirect mildly ill patients from the main ED, thus expanding capacity and decreasing waiting room occupancy and dwell time. There was also a goal of cohorting patients to limit exposure risks to other patients and to staff.

Inclusion and exclusion criteria **(Table 1)** for patients were designed to identify patients who 1) were at low risk of severe illness, 2) required minimal intervention or testing, 3) who

Table 1 Inclusion and exclusion criteria for the tent.

Inclusion Chief Complaints	Exclusion Criteria
Concern for COVID or requesting COVID testing	Ill appearing "Sicker" or "Sickest" on Pediatric Assessment Triangle
Congestion/Cough	Increased work-of-breathing/retractions Difficulty breathing
	Audible wheeze or report of wheezing Tachypnea
	Shortness of breath
	Pulmonary disease (Asthma, chronic lung disease, ex- preemie, etc.)
	"Sicker" or "Sickest" on Pediatric Assessment Triangle
Fever	Resource required per ESI
	"Sicker" or "Sickest" on Pediatric Assessment Triangle
Vomiting	Actively vomiting or nausea (due to limited EVS in tent) Appears dehydrated
	Known or suspected trauma
	"Sicker" or "Sickest" on Pediatric Assessment Triangle
Sore throat + URI symptoms	Sore throat without URI symptoms Concern for strep throat
	"Sicker" or "Sickest" on Pediatric Assessment Triangle
Diarrhea	Actively experiencing diarrhea (no restroom in the tent) Appears dehydrated
	"Sicker" or "Sickest" on Pediatric Assessment Triangle

were appropriate for an enclosed but not secure environment. Evaluation and intervention were limited in the pandemic surge tent in order to both limit any cross-contamination of patients, limit exposure of the providers to high risk exposures, and facilitate rapid throughput of patients. No high-risk or aerosolizing procedures, including nasal suctioning and administration of nebulized medications, were to be done in the tent. Patients were not undressed or placed into gowns. Patient flow through the tent was one-way flow from intake to discharge. Any patient requiring additional treatment or evaluation was moved from the tent location to the main ED (approximately 25 feet from the tent exit to ambulance bay ED entrance) **(Figure 1).** A code cart was located near the tent to allow easy access to the cart. Personal Protective Equipment (PPE) was worn at all times by staff and was at level of droplet precautions per the CDC recommendations (included surgical mask, gown, gloves and face shield). All patients and family were masked with simple surgical mask.

The use of a tent for pandemic expansion had been discussed within the institution prior to the present pandemic; however detailed plans for using such a tent did not exist. A diverse team of stakeholders was convened to coordinate the operational logistics. A tent was purchased and was later retrofitted with closing doors, rather than the original zippered entrances, but did not have negative/positive airflow capability. Complications of setting up a new clinical area are not isolated to our experience and included the need to establish electrical and information technology links as well as procedures to move an ill patient to the ED proper. A manual for set-up and operation of the tent was created and reflected the diverse needs of medical care in an electronic medical record era.

Figure 1 Photograph of pandemic surge tent.

Intervention

Task force development

To begin the process of creating an extended care space in an external surge tent, a request for authorization was submitted to the state health department. Once approval was received, a collaborative task force of ancillary department representatives was developed to coordinate the logistic efforts required to operationalize the extended care area. The taskforce consisted of information technology (IT) infrastructure, network infrastructure, IT solutions, nursing informatics, ED providers, ED nurses and ED nursing leadership, clinical applications services, electrical utilities management, facilities, materials management, patient registration, environmental services, security personnel and compliance and safety. Over the course of two weeks, daily meetings occurred to update the group on progress of identified actions by the members.

The taskforce selected a location just outside the ambulance entrance to the ED, under the ambulance overhang for tent placement. Despite identified structural and safety obstacles, the team felt this was the best placement with adequate space and moderate protection from inclement weather. During normal operations, this space serves as additional ambulance parking and as the casualty collection point for decontamination of patients. Traffic barricades were placed in front of the tent and throughout the pedestrian walkway to serve as a safety barrier between the parking lot drive and care area. The taskforce ensured that placement of the tent continued to allow access to the ambulatory and non-ambulatory decontamination showers if

needed. A personal protective equipment (PPE) donning station was established in the non- ambulatory shower room inside the main ED. In this area, staff changed into hospital provided scrubs and required PPE prior to entering the tent. The location selection also supported a one directional patient flow pattern, from the ED public entrance to the entry of the tent, patients then exited the back of the tent to discharge home or to enter the emergency department proper through the EMS entry doors. The exit door of the tent was well positioned for transport of patients to negative pressure rooms or trauma rooms should an urgent situation arise.

The main cost to operation was the initial purchase of the tent. All other equipment was repurposed from the ED or other areas in the hospital. Staff was pulled from regularly scheduled ED shifts and thus no additional staffing costs were incurred.

Assembly

Assembly of the tent required three working days. On the first day, an electrical panel was installed in the designated space to prevent the use of a mobile generator and avoiding the additional noise associated with the running of the generator. Once power was available, the tent structure was erected, and internal lighting and power outlets were installed over an 8-hour period. On day three, internal dividers were hung, flooring traffic patterns covered with non-slip rugs, the WI-FI booster installed and portable sinks were assembled. After fire extinguishers and caution/exit signs were installed, a life safety walkthrough was completed, and the fire marshal inspection resulted in approval for use.

While facilitates assembled the tent, ED clinical subject matter experts identified medical items needed in the extended care area and assembled necessary supplies **(Table 2).**

Environmental services established protocols for terminal cleaning at the completion of each operational period, which included disposing of the gray water refilling the potable water in the portable sinks. Closing and opening procedures were developed by the task force. Security was assigned to round while the tent was operational and kept an occasional presence outside of established operational hours.

Staff education and orientation

To ensure ongoing staff education and orientation of staff members new to the external surge tent, a tent orientation plan was developed to educate the clinical team regarding emergency response, communication channels, role definitions and operation procedures. The subject matter experts facilitated frequent orientation sessions over a one-week period.

During the orientation time frame, simulations were conducted to test different aspects of operations and care delivery. Simulated patients were moved through the initial patient sort process to evaluate appropriateness of tent designation. These simulated patients continued through the process map with frequent injects to test the response of staff, supplies, equipment and communication capabilities. These injects included (1) a patient vomiting, to assess body fluid containment, staff doffing contaminated PPE and the response of environmental services in the extended care area, (2) the medical decompensation of a patient, to evaluate code blue and rapid response capabilities, as well as the hand-off of a critical patient from the tent team to the responding ED team, (3) a security alert, using multiple channels of communication, ensuring there is back-up communication systems and discussing the PPE required for security upon

Table 2 Tent supply list.

Supply Cart		
Otoscope heads (2 rows)	Non rebreather (2 ped; 2 adult)	Gloves (2 boxes of S, M, L and 1 box XS)
Alcohol pads (1 box)	Pulse ox probes (20)	Yellow mask/child masks (2 boxes of each)
Ear curettes (5-6 of each colour)	Rescue-Vac's (1 on shelf, 1 on code cart)	Oxivir wipes (2)
Tongue depressors-(40 each)	Chux pads (1 packs)	Yellow lines gowns (20 each)
Emesis bags (10 each)	Thermometers (2)	Hand sanitizer (2 bottles-for WOWs)
ORT fluids (Pedialyte, Gatorade, oral syringes)	2 * 2 gauze (30)	Hand sanitizer stands/stations (6-place 4 in tent, 2 outside tent each end)
	Patient belongings bags (10)	
Nose Frida (3)/saline bullet (10)	Band-Aids (1 box)	3 waist belts
Nasal cannulas (2 each size)	1-inch tape (1 roll)	Stethoscopes 8
Equipment		
Code cart	Hand washing sinks (2)	1 cloth linen dirty bin
1 Emergency pram with slider board, O2 tank inside ambulance bay	1 biohazard trash	3 Chairs each exam room
1 pram outside tent	1 shredder bin	Chair for greeter/front
1 O2 tank with chariot	5 tall trash bins	2 small tables, (1 don, 1 doff)
1 portable monitor	1 pulse ox recycle bin	2 sink systems with paper towel stands
2 fire extinguishers and stands	Barriers, dividers, and caution cones to direct walking traffic flow	
IT Equipment		
WOW's (4)-two with scanners and cameras	IT cart	2 interpreters on wheels
Paper printers	Large label printer	1 Cisco phone
Name bracelet printer	Beaker label printer	1 uplink port
2 walkie-talkies (one security, one greeter)	4 PCDs	1 repeater radio

entering the tent, (4) treatment of a behavioral health patient or a positive suicide screening result. This simulation period also included testing of IT systems, printers, medication scanner, tent bed spaces created in the hospital electronic medical record, video interpreter functionality for a non-English speaking patient or family, and a scribe's ability to hear and communicate with the provider from a remote position. Through these simulations IT failures were identified and corrected, sorting criteria was adjusted, and processes were adjusted to accommodate the noise challenge of the ventilation system and open space conversations.

In order to document changes made during simulations and to record the process for future use, an operations manual was created. The operations manual houses orientation documents, sorting criteria, closing and opening procedures, supply lists and IT resources. Multiple copies of the manual were available to support standardization of education and clinical operations and for replication of tent set-up an operations for future use.

Staffing and hours of operation

The COVID-19 Pandemic Surge Tent was open 10 hours per day, from 12PM to 10PM, and was staffed by personnel that were relocated from regularly scheduled shifts within the main ED. The goal was to utilize staff already scheduled in order to minimize additional staff exposure to illness as well as to minimize the cost of operation. The providers were a combination of general pediatricians, nurse practitioners and physician assistants, all emergency medicine trained. The providers worked in two separate shifts that were each six hours long with an hour of overlap to allow for completion of patient care as well as closing down of tent operations in the evening. The tent was staffed by one nurse and one emergency medical technician (EMT), also diverted from regularly scheduled shifts in the ED. Scheduled breaks were set to allow for staff to briefly doff their PPE, hydrate, etc. The tent was equipped with heating and cooling to maintain a desirable temperature within the unit. Two of the days of anticipated operation the tent was not utilized due to snow and low temperatures that made it undesirable to walk patients outside the building into the tent despite the internal temperature of the tent being acceptable.

Technological capabilities

The pandemic surge tent was equipped with wireless connectivity through the use of extenders from the main hospital wireless system. This was possible due to the physical proximity of the tent to the main hospital building. The tent provider and nurse both utilized a workspace on wheels (WOW) that could be mobilized into individual patient rooms for documentation, chart review, order placement, as well as addition of specific discharge information not included on pre-printed discharge forms. The provider WOW was equipped with video and microphone capabilities that allowed for two-way communication via Skype software with a scribe who was physically located within the main hospital, away from patient care areas. The scribe documented the visit note within the electronic medical record (EMR) and asked clarifying questions as needed. This system provided the ability to expedite patient care visits and have complete charting within the EMR at completion of the patient visit while protecting the scribes from exposure to illness. For patients who had a primary language other than English, a video interpreter device was available to assist with communication. Staff working in the tent were also able to communicate with staff located in the main ED through the PIVOT phone units that are regularly utilized in the ED, radio communication used in the main ED to reach the flow or Critical Care Trauma RNs for movement of patients or needs, as well as a separate CB radio was available to directly contact ED security if necessary.

Patient selection, flow, and documentation

Upon arrival to the main ED, patients were screened by security, registered, and entered into the electronic medical record prior to initial nurse evaluation **(Figure 2).** Patients with chief complaints within the set inclusion criteria **(Table 1),** as well as low acuity (ESI level 4 or 5), were triaged to the pandemic surge tent. Patients were not assigned to the tent if they would require lab evaluation, deep nasal suctioning, radiology, or nebulized medications. This process occurred in the waiting room of the main ED where they received a "quick registration" and brief initial triage with the pediatric assessment triangle and ESI assignment. Due to space constraints, weather limiting outdoor screening, and the goal of maintaining processes similar to current ED procedures, we did not significantly change our initial ED screening process. Patients designated to be seen in the main ED were cohorted into "sick" and "well" waiting areas within the main ED waiting room.

If a patient met criteria for the pandemic tent, they were provided with a sticker indicating they were to be seen in the tent marked with that day's date. They were then escorted outside the building, down a marked path to the tent entrance by a designated escort. Once inside the tent they were placed into one of the patient care bays for secondary triage, medical evaluation, treatment, and discharge. Due to low overall patient volumes, no designated waiting area was required for patients designated to the tent, they were all able to be roomed immediately. Patients were not allowed to enter the tent without the appropriate screening sticker to avoid direct entry into the tent prior to security screening and patient registration.

Documentation was completed in the usual ED electronic medical record (EMR) with the assistance of a scribe linked in via telehealth (described separately). Patients were provided with discharge instructions printed from the EMR or from select pre-printed discharge instructions as appropriate. COVID-19 specific discharge instructions were created including a description of concerning signs and symptoms and guidelines for quarantining of symptomatic patients and family members. The surge tent had the capability to print prescriptions and school or work excuses as needed. Billing practices mirrored patients seen in the main ED. Patients were discharged out of the back of the surge tent to create one-way patient flow.

Medications and interventions

Medications administered in the pandemic tent were limited

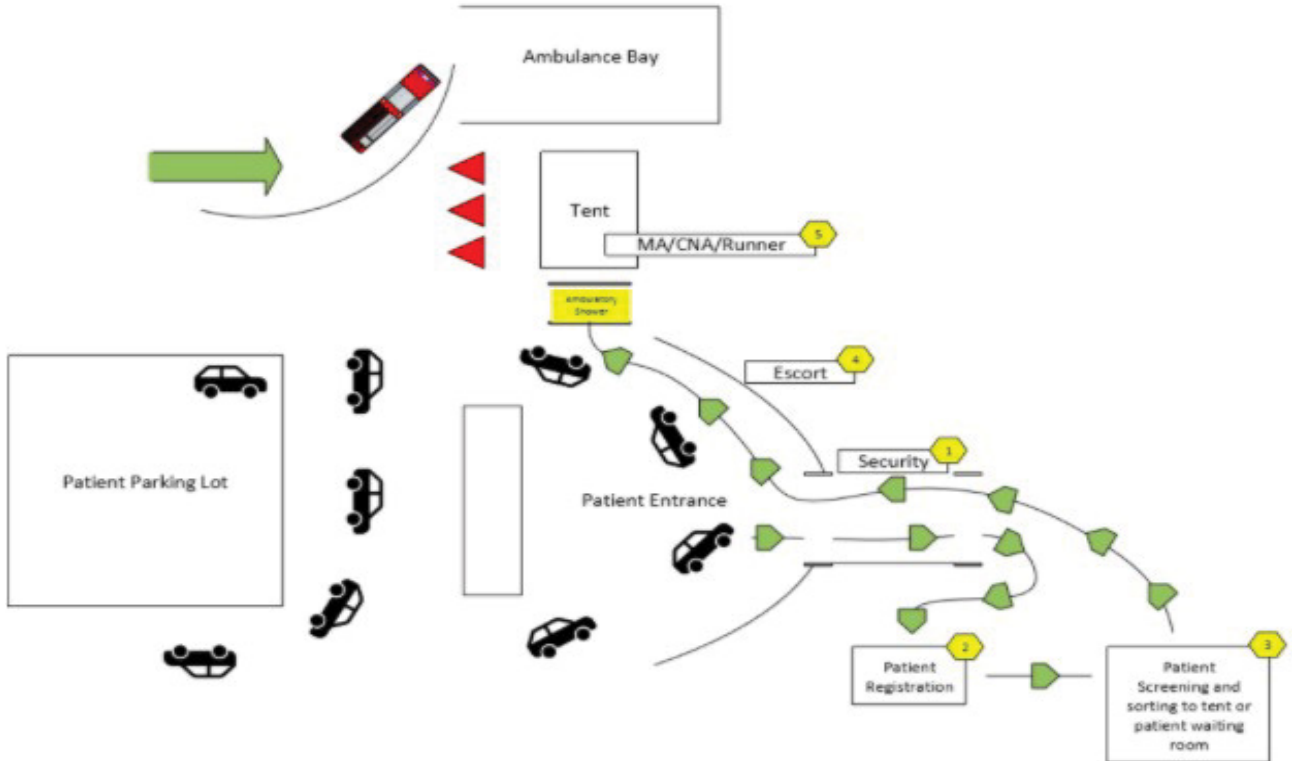

Figure 2 Patient flow schematic.

to antipyretics and ondansetron. No albuterol administration or nebulized medications were allowed. Medications were not housed in the pandemic tent but rather located in the main ED in the usual secure location. "Runners" were used to obtain medications and deliver to the tent for administration.

If a patient had medical needs greater than simple evaluation and treatment, a procedure to re-locate to the main ED was in place. Rapid placement was arranged by a call to the charge RN who made an ED room available. The patient was transported inside by the pandemic tent EMT or RN and care of the patient was handed off to the main ED team via our usual handoff procedures.

Personal protective equipment

When planning PPE for staff and patients in the ED pandemic surge tent, consideration was given first to protection and secondly, preservation. All staff wore reusable, impermeable gowns, surgical masks, plastic face shields and gloves. Between each patient interaction, gloves were changed, hand hygiene was practiced and the front of the face shield was wiped down with a germicidal wipe. Masks and gowns were not changed between patients. A paper log was kept at the front of the tent to track time in PPE. Staff was given a break after roughly 2 hours in PPE to cool off, use the restroom and drink water. Patients over 2 years of age and all accompanying family members were required to wear a surgical mask supplied in triage.

Results

The average daily census of our Emergency Department for this time period for the previous three years was 190 visits per day. Due to perceived community fear surrounding the pandemic virus outbreak as well as strict shelter-in-place orders of the surrounding metro area, we had an unanticipated decrease in volume to 40% of normal. Despite the decrease in total ED volume during this time, we continued with operations in the pandemic surge tent to improve cohorting of patients for protection of patients and staff.

The pandemic surge tent opened on March 30, 2020 at 12PM and over the first day approximately 7.5% of total daily ED volume was seen in the tent during the ten hours of operations. Throughout the remainder of the days of operation, providers in the tent treated a range of 1.3% to 6.5% of total daily ED volume, with an average of 5.4% of total ED volume seen in the 10 hours that the tent was operational each day. Two of the days of anticipated operation the tent was not utilized due to inclement weather making it undesirable to walk patients outside the building into the tent.

Over the entire operation period, only two of the patients who were initially triaged to the tent required transfer to the main ED for additional evaluation; 1 required nebulized breathing treatments and 1 required a chest X-ray to evaluation for pneumonia. Both children were ultimately discharged to home. The remainder of the patients evaluated in the pandemic tent

was discharged directly to home. No patients required emergent transport for immediate resuscitation. Additionally, despite the use of runners for medications that were given in the tent, there were no significant delays in medication administration noted during operation.

The left without formal evaluation rate was 0% for patients triaged to the tent as well as patients being seen within the main ED throughout this time period, far lower than the average rate during normal operations. There were no additional wait times appreciated with being seen in the tent as patients were able to be roomed and seen immediately by a provider. For patients seen in the pandemic tent, the average length of stay over all hours of operation was 33.2 minutes, range 11 minutes to 114 minutes.

Due to low overall ED volumes, we decided to discontinue use of the pandemic tent after approximately two weeks of operation. ED volumes were closely monitored to establish that there was no additional surge likely to incur and the tent was subsequently taken down. The main cost to operation was the initial purchase of the tent. All other equipment was repurposed from the ED or other areas in the hospital. Staff was pulled from regularly scheduled ED shifts and thus no additional staffing costs were incurred.

Limitations

Our findings are descriptive in nature from a single children's hospital institution and may limit the generalizability of our findings to other pediatric institutions. This report offers a description of the development and implementation process used at our institution as well as the type of patients successfully managed by pediatricians and mid-level providers in a newly formed ED surge tent. However, the patients we treated in our tent may be a biased sample of patients compared to the overall COVID-19 low acuity patients during this pandemic due to the limited time that our tent was operational. This limited time of functionality due to the unique nature of this COVID-19 pandemic was not predictable. Nonetheless, the process and observations in setting up this tent provided important information and lessons. How to change our thoughts on the usefulness of the tent is likely a common dilemma for other pediatric institutions. Considering the use of pediatric surge areas to screen and/or treat a surge of adult COVID-19 patients provided a useful exercise in tent flexibility. Finally, although we discuss several important quality improvement outcomes that can be associated with the use of a tent, this was not a formal quality improvement study and thus limits the conclusions that can be made.

Discussion

The rapid spread of the novel coronavirus in our community and review of prior use of pandemic tents in the pediatric setting [5] led us to believe developing a process for use of a pandemic tent was a worthwhile practice. We feared high left without being seen rates in the event of ED overcrowding and wanted to develop a process to isolate infectious patients to limit exposure to the pandemic virus for staff and other patients within the main ED. Finally, a recent minor measles outbreak in our hospital highlighted that our physical space and patient flow was less than ideal for containing highly infectious pathogens.

Extensive planning and preparation was required to operationalize a space external to the actual hospital. The three-week preparation was longer than initially expected. Guidance from a project management team was invaluable in quickly organizing multiple departments to operationalize a pandemic surge tent. In addition, the practice of patient simulation with varying injections was helpful in guiding successful patient flow and evaluation once the pandemic tent was in normal operation.

Challenges in operation included extending IT infrastructure outside of the hospital. We considered using paper charts and scanning information into the medical record, as well as using pre-printed discharge information, however, direct use of the electronic medical record and real time selection and printing of discharge instructions and prescriptions was preferred. An additional challenge of the operational set-up was related to scribe utilization. We wanted to utilize a medical scribe to assist with charting in the event of heavy volumes and rapid patient turnover while minimizing their exposure to illness. In order to face these challenges, we engaged with IT early in our process. The extension of IT services to the pandemic surge tent including telehealth via secure Skype to connect with our medical scribes in a remote office, was one of the most successful aspects of the project. In addition, the ability to use hospital PIVOT phone devices in this external space required IT extension but afforded us additional patient safety resources in that we had the ability to easily reach the main ED in the event of the need for rapid patient transfer or additional resources in the pandemic tent.

Low pediatric ED volumes during the pandemic affected our ability to fully test the true capacity of our new process. This decrease in volume was in stark contrast to prior studies evaluating medical centers' response to H1N1 where large surges of patients were observed [6,7]. Strict screening criteria as well as the limited operating hours led to very few patients being evaluated in this space. Though we report low left without being seen rates at 0%, this is likely more related to low total census rather than success of the pandemic tent, as the left without being seen was 0% in the main ED during this time period as well. We considered expanding criteria in order to allow more patients to be assigned to the tent but our low rate of patients requiring transfer from the tent to the main ED argued that our criteria was suitable and thus we did not make a change.

Acknowledging overall low ED volumes, we were successful in isolating patients with concern for COVID-19. While we do not know the total number of SARS-CoV-2 positive patients seen in the tent due to limited testing capabilities during this time, no staff who either worked in the tent or inside the main ED were known to become infected during this period, which speaks positively to this infection control measure.

Conclusion

We were effectively able to use an external surge tent to evaluate and discharge appropriate patients during a pandemic state.

The process we utilized in the external surge tent mirrored our processes inside the main hospital so that the practice could be mobilized quickly in this pandemic and as needed in the future. The tent was effective in limiting infection risks inside the main ED, protecting vulnerable pediatric patients, and preserving essential ED staff.

Ultimately, the low volumes in both the main ED and the pandemic tent lead us to discontinue use of the pandemic tent. Although our operation time was short, the process of setting up the physical tent, accessing IT services and operating the tent provided valuable practice and information for the future. We recorded all operations in a detailed manual in order to reference the process in the future should we have a surge in the COVID-19 pandemic, a future pandemic outbreak, or other disaster state that would benefit from an external tent space. Finally, we also hypothesize that we could use similar operations to help manage high ED volumes during our yearly seasonal surges due to respiratory viral illnesses.

References

1 Pershad J, Waters TM (2012) Use of tent for screening during H1N1 pandemic: Impact on quality and cost of care. Pediat Emerg Car 28: 229-235.

2 Nager AL, Khanna K (2009) Emergency department surge: Models and practical implications. J Traum Acut Car Surg 67: S96-S99.

3 Anthony C, Thomas TJ, Berg BM, Burke RV, Upperman JS (2017) Factors associated with preparedness of the US healthcare system to respond to a pediatric surge during an infectious disease pandemic: Is our nation prepared?. Amer J Disast Med 12: 203-226.

4 Scarfone RJ, Coffin S, Fieldston ES, Falkowski G, Cooney MG, et al. (2011) Hospital-based pandemic influenza preparedness and response: strategies to increase surge capacity. Pediat Emerg Car 27: 565-572.

5 Cruz AT, Patel B, Di-Stefano MC, Codispoti CR, Shook JE, et al. (2010) Outside the box and into thick air: Implementation of an exterior mobile pediatric emergency response team for North American H1N1 (swine) influenza virus in Houston, Texas. Ann Emerg Med 55: 23-31.

6 Fagbuyi DB, Brown KM, Mathison DJ, Kingsnorth J, Morrison S, et al. (2011) A rapid medical screening process improves emergency department patient flow during surge associated with novel H1N1 influenza virus. Ann Emerg Med 57: 52-59.

7 Charney RL, Armbrecht ES, Kennedy BR, Flood RG (2012) Pandemic influenza extension areas in an urban pediatric hospital. Prehosp Disast Med 27: 75-80.