Rapid Development of Resident-Led Procedural Response Teams to Support Patient Care During the Coronavirus Disease 2019 Epidemic

A Surgical Workforce Activation Team

Surgeons are no strangers to mass casualty incidents. Although the coronavirus disease 2019 (COVID-19) epidemic may not involve many trips to the operating room, the lessons learned in organizational management of prior natural disasters, mass shootings, and transportation incidents are valuable. At our institution, more than a quarter of patients who initially present with COVID-19 have been intubated, requiring multiple, time-consuming bedside procedures for hemodynamic monitoring and central venous access. As the hospital architecture has changed to suit the demands of the coronavirus pandemic, its workforce has also needed to evolve.

In response, the surgical residency has created a special team, the surgical workforce activation team (SWAT), to help offload procedural work from the other emergency medicine, critical care, and medicine departments. The mission of the SWAT is to build and deploy a specialized team of clinicians with the skill set to efficiently perform bedside procedures in an effort to support our colleagues, reduce health care personnel exposure, preserve personal protective equipment, and provide quality care to patients during the COVID-19 pandemic. We have performed common, time-consuming procedures, including setting up central catheters, arterial catheters, and dialysis catheters, thereby alleviating the workflow of intensive care unit (ICU) teams.

Preparation
As we set up the SWAT, we sought to create a process-driven team available 24 hours a day, 7 days a week (in two 12-hour shifts a day). Each team consists of 2 senior surgical residents, a surgical intern, and a surgical attending physician. Attending physicians are from diverse backgrounds that have included trauma, acute care, hepatobiliary, colorectal, vascular, and pediatric surgery and even interventional radiology.

First, we developed an encrypted central messaging system to contact the SWAT through multiple modes of communication: telephone and the electronic medical record. The ICU and emergency department teams can order a SWAT consult within the electronic medical record or send a message to a dedicated pager. As a patient is admitted to an ICU or following intubation in the emergency department, the primary team orders the SWAT consult and includes the access type desired, with a telephone number for a call back.

Next, we have created our own central supply of materials in concert with the anesthesia department and hospital supply managers to avoid depleting the ICU and floor supply closets. We have obtained 3 portable ultrasonography machines from the anesthesia and vascular surgery departments. We have developed a system to ensure the availability of SWAT go bags, which contain all materials we have deemed necessary for 1 patient (Box).

As the final step of preparation, we promoted the SWAT with flyers at every ICU and emergency department nursing station. We have also ensured that the anesthesia, critical care, and emergency department teams are aware of the procedural services by sending announcements via their departmental listservs.

Activation
After receiving a request for a bedside procedure, the team verifies the indication for the procedure, as well as any contraindications. If the patient has recently been intubated, we wait for 30 minutes afterward to ensure aerosolized virus particles have cleared the patient’s vicinity. A family member is contacted by the primary team or SWAT to provide consent for the procedure.

We have found that sending 2 team members to each procedure allows for 1 resident physician to act as the proceduralist and the other to act as an assistant located outside the room. Generally, the proceduralist is a senior surgery resident (program year 3 or higher), and the assistant is a surgical intern. This allows the minimization of personal protective equipment and excessive supply use, which is key in the current setting of disrupted supply chains and shortages. During the procedures, the proceduralist wears an N95 mask covered by a surgical mask (to extend its lifetime), an eye shield, a surgical gown, a bouffant head covering, and sterile gloves, which are donned and doffed appropriately. The assistant and supervising attending physician typically remain outside the patient room with the SWAT go bag. The proceduralist then brings in the minimum amount of supplies needed, and the assistant is available outside the room to pass in any additional supplies to the proceduralist as needed. The attending physician supervises all procedures and participates if needed.

A high incidence of acute kidney injury has been described in patients infected with COVID-19. Based on availability, we place a triple-lumen dialysis catheter on the right side of the neck in patients in whom there is a high suspicion for possible kidney therapy in the future. When this has been possible, we have preferentially placed central venous catheters in the left internal jugular vein, preserving the right internal jugular vein for future dialysis catheter placement to achieve optimal flow rates. Fem-

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oral catheters have generally been avoided because of the inherently higher risk of thrombotic and infectious complications. The patients have required multiple lumens because of requirements for pressor, sedation, and paralytic medications. As a result, the policy is to always place triple-lumen catheters.

Because of considerable shortages of disposable equipment, we have been quite minimalistic in the supplies used. We have used the 18-gauge syringe included in the central catheter kit rather than adding a micropuncture kit. Each proceduralist is expected to establish proper venous cannulation prior to use. We have required visualization of the guidewire in the vein with ultrasonography in a cross-sectional and longitudinal view prior to dilation. Using extension tubing to create a venous manometer is accepted as well. These safety considerations are crucial when portable radiography machines and technologists are in short supply because of high patient volume.

Bundling procedures is an efficient way to minimize personal protective equipment usage and personnel exposed to severe acute respiratory syndrome coronavirus. We have preferred to place indwelling urinary catheters, orogastric or nasogastric tubes, arterial catheters, and central catheters at the same encounter to prevent multiple staff members from entering the room at different times. We have also requested that if we are called for these procedures immediately after intubation, only 1 chest radiograph is performed at the culmination of all these procedures. This policy minimizes the need for radiology technicians to have repeated exposures and patients to have multiple radiographs.

**Postprocedural Follow-up**

Immediately following the procedure, a procedure note is written, including the procedure type and catheter location, size (French), and length. If a chest radiograph is performed following a procedure, the proceduralist resident is responsible for following up its reading. All chest radiographs are also read by a board-certified radiologist. If a pneumothorax is found after catheter placement or intubation, our team can place a chest tube. Each patient is added to a master database, which will be used for continuous quality improvement going forward.

If applicable, *Current Procedural Terminology* billing codes are applied to the procedure note, and it is signed by the attending proceduralist. The billing code allows a surgical department to show productivity despite the COVID-19 pandemic, in case reimbursement is based on revenue value units.

In the first 7 days of the SWAT’s work during the COVID-19 pandemic, we received 174 consult requests and placed 137 central catheters and dialysis catheters, 77 arterial catheters, 2 paracentesis catheters, 2 laceration repairs, and 1 chest tube. Initial feedback from colleagues in the ICUs and emergency department has been overwhelmingly positive, with many emphasizing their ability to focus on patient care without the burden of time-consuming procedures.

The SWAT has become an integral part of our hospital’s response to the COVID-19 epidemic. Strategic appropriation of resources will be key to a community’s success in treating the virus. Our technique of using surgical staff as a rapidly deployed access team is an efficient use of staffing, personal protective equipment, and supplies that will aid in the treatment of all patients.