

The Effect on Trauma Care Secondary to the COVID-19 Pandemic

Collateral Damage From Diversion of Resources

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The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus rapidly and likely permanently changed the delivery of health care through hospitals across the country. These changes were implemented out of necessity during the surge of COVID-19 patients but have short- and long-term unintended consequences to our trauma centers. Severe injury does not respect the constraints placed on healthcare during the pandemic. Trauma was and will continue to be a major health policy issue and leading cause of death and disability. The potential for “collateral damage” on the trauma patients themselves and the critical missions of trauma centers and systems is of growing concern. In the short term, many resources redeployed to treat the expected numbers of COVID-19 patients may have left some trauma systems and centers under-resourced with limited capacity to treat injured patients. In the long term, the financial pressures related to COVID-19 may threaten trauma center viability.

Trauma centers are a national resource and have multiple missions. Trauma centers are often essential hospitals treating marginalized and underserved populations. These populations and communities have been hit the hardest by the COVID-19 pandemic. In addition to providing high-level trauma and surgical critical care, trauma centers are responsible for injury prevention, trauma education, performance improvement (PI), and research. They also play a key role in regional trauma systems and the overall population health of their communities and states. The purpose of this commentary is to describe and outline the threats to trauma care across the country and to the missions of trauma centers and offer some potential solutions to these problems.

ACUTE INPATIENT CLINICAL CARE

As cases of COVID-19 begin to surge at our trauma centers, changes in the delivery of direct patient care to injured patients require modification.¹ These changes are most likely to result unintentional harm and collateral damage to injured patients. The persistent difficulty in the universal availability of rapid testing and the significant false negative rates early in the course of disease have

left most hospitals in high prevalence areas to treat every trauma patient as potentially COVID positive. Although this may not yet be true outside of previous hotspots, it is becoming more apparent that this approach is necessary as the pandemic moves throughout the country. Contemporaneously, shortages of personal protective equipment (PPE) were limiting the number of personnel directly treating patients in trauma resuscitations to minimize potential exposure.² Managing trauma patients under these conditions may delay immediate emergent care. For example, high-risk aerosol generating procedures, such as endotracheal intubation and emergent tube thoracostomy,³ require significantly more preparation time than in pre-COVID times. The enhanced PPE may also dramatically hamper emergency medical services (EMS) handoffs and communication in the trauma bay and operating room.

Modern trauma resuscitation is dependent upon blood and blood products to save severely injured patients. Following directives from blood supply providers, many trauma centers have adopted more restrictive transfusion practices⁴ and modified their massive transfusion protocols to deal with potential shortfalls in blood availability. Some centers are limiting the use of emergency department resuscitative thoracotomy, departing from standard indications.⁵ Although during the surge it seems the blood supply has been maintained, the long term potential for blood product shortages are real. As hospitals begin to open for necessary elective surgery, there will be increased competition for a potentially diminished supply. Blood availability is dependent upon public donation events and community-based blood drives that are contrary to, or impossible with social distancing. Changing people’s habits and practices for donation will take time but a national public health initiative by the American Red Cross and others is necessary to maintain our blood supply. The testing of convalescent plasma is currently ongoing and if this therapy is beneficial for COVID-19 patients, plasma maybe even scarcer for trauma patients.

Shortages of PPE may also influence the number of times clinicians will round on a patient at the bedside. Long gone are the days of pre-rounding by residents, followed by multiple visits during the day by attendings and/or advanced practice staff. The ongoing need for increased use of PPE will continue over the next several years and will remain a potential barrier to patient care and a persistent cost to health care systems. Trauma programs will need to be vigilant to avoid “rounding in the hallways” because donning and doffing PPE for each patient is too onerous. Intensive care unit (ICU) patients requiring prone positioning for respiratory support have more limited access to assess wounds and more difficulty in performing dressing changes. Even the timing and performance of common, routine procedures such as tracheostomy and percutaneous gastrostomy tube placement is under scrutiny.⁶ Many hospitals are restricting early tracheostomy due to the perceived risks of incidental viral transmission.⁷ Even if we were able to test patients, the known false negative rate would not make a negative test reliable enough to limit PPE or exposure. The accepted benefits of early tracheostomy is no longer available to trauma patients, potentially increasing ventilator days, ICU/hospital length of stay, and complications such as pneumonia.

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Early rehabilitation and therapy improve trauma outcomes. Yet these services are diminished during COVID due to shortages of PPE and limiting the number of times healthcare workers of all types enter a patient's room. Ongoing shortages of sedative and pain medications have resulted in increased complications such as incidence of self-extubation and have made management of traumatic brain injury more difficult. While statements like this are not yet supported in the peer-review literature, our discussions with trauma surgeons across the country confirm that these are not isolated, rare findings. The multidisciplinary efforts to decrease catheter associated urinary tract infection by early catheter removal have given way to the ease of patient care under stressed nursing ratios leaving them in place.

There are undoubtedly other aspects of trauma care delivery that are similarly affected such as delaying total fixation of extremity fractures pending the results of COVID testing, which was a problem early in the pandemic. This issue is ongoing to different degrees at centers across the country and will only be resolved once there is widely available access to rapid testing. Lack of operating room availability for urgent cases will remain problematic. Operating room facilities are currently closed due to staff reassignments or less available due to COVID-19 related increased cleaning and turnover times. We expect this phenomenon to worsen during the later chronic phases of the pandemic as health care facilities begin to address urgent (eg, oncologic, cardiovascular) cases that were postponed and trauma cases are competing for those operative slots.

PHYSICIAN STAFFING

Over the past several decades, acute care surgery (ACS) (comprising trauma, surgical critical care, and emergency general surgery) has established itself as a formal subspecialty. Data has shown that outcomes are better when dedicated full-time ACS surgeons treat patients.⁸ During the pandemic, the rapid spike in the severity of illness and the sheer numbers of ICU patients being treated for COVID-19 pulled many ACS surgeons away from their trauma and emergency general surgery practices to cover the surging ICU. The downstream effect was that many acute care service lines – including both trauma and emergency general surgery – were and are staffed by non-ACS surgeons – with or without ACS surgeon expertise and collaboration.

Although there is no question that our non-ACS colleagues are outstanding clinicians, they are simply not as facile with many of the operative and nonoperative nuances of trauma care and familiarity with current protocols and treatment guidelines.⁸ It remains unknown how these overall changes in staffing trauma and ACS will influence outcomes. Real-time review of clinical cases (eg, daily trauma morning report) have been shown to ensure optimal care and produce equivalent outcomes even when that care is delivered by novice or junior faculty.⁹ Trauma morning report usually has numerous attendees cramped into a small room which is not acceptable during this pandemic. Although video conferencing might be an ideal solution, the logistics to conduct this type of conference may not be feasible at many institutions. Expansion of service lines has resulted in increased shift work by both residents and faculty making daily morning report and clinical turnover more perfunctory than educational.

As the pandemic continues it is likely that many front-line providers will be infected and/or quarantined, further reducing the availability of full-time ACS surgeons. Some trauma centers have enough clinicians to have a rotating pool of team-members as a “home cohort” available as backup in case a team member becomes sick with COVID-19.¹ Although this approach is possible at larger, well-staffed academic trauma centers, this is not possible at centers who were barely able to cover before the pandemic began.

PERFORMANCE IMPROVEMENT (PI)

Trauma centers are renowned for their robust and in-depth PI programs and activities and they are the cornerstone of the American College of Surgeons Committee on Trauma (ACS-COT) trauma verification visits. Experienced personnel including nurses and other health care professionals staff many of these PI programs. At this time in the pandemic, many hospitals are resorting to the “all hands on deck” approach to deliver bedside, patient care. Many PI trauma staff are redeployed from their routine roles of abstracting charts or daily PI. Physicians overburdened with caring for patients in traditional and nontraditional areas may not be available to do timely chart reviews. Data that are uploaded to state, regional, and national platforms such as the ACS-COT Trauma Quality Improvement Program (TQIP) will likely be affected in both timeliness and quality. Lastly, with the surge of patients into a facility, the completeness of documentation in the electronic health record may decline. While necessary to maintain the trauma center, the trauma registry and a robust trauma PI program is also costly. The financial constraints placed by COVID-19 will be long lasting and will decrease the financial support for trauma center personnel for a prolonged time period. All these concerns may have a potentially deleterious effect on PI activities, which are vitally important to maintain high quality trauma care. It will remain to be seen, how these issues will influence the outcome data in TQIP in subsequent submissions. It is incumbent on the ACS-COT to continue to maintain standards and champion trauma centers' dependence on data for PI with the recognition that a comprehensive PI program is associated with high value trauma care.

TRAUMA EDUCATION

Another vital mission of trauma programs is education at all levels for multiple providers. American College of Surgeons trauma educational programs such as Advanced Trauma Life Support, Bleeding Control (Stop the Bleed), Advanced Surgical Skills for Exposure in Trauma, and Advanced Trauma Operative Management are currently suspended throughout the country. It remains unknown when they will resume in their routine, in-person format or whether there will changes to the delivery of these educational programs. It is likely that web-based platforms to deliver required medical, nursing, and paramedic educational hours are expanding and will be a permanent change to continuing education. Yet, in person classes remain necessary for many aspects of health care education. Graduate and undergraduate medical education is currently in flux for all learners, not just those focused on trauma. ACS programs often provide a large share of direct hands-on education to learners from general surgery, emergency medicine, surgical subspecialties (eg, orthopedics, neurosurgery), and critical care medicine. As this pandemic is predicted to be with us for up to 2 more years, how to maintain this educational mission and focus needs further consideration.

INJURY PREVENTION

A much-discussed question is how surging cases of COVID in the United States are affecting the overall incidence of trauma. Anecdotally from some high prevalence areas of the country, there has been a decline in overall trauma volume. Other cities have noted a dramatic increase in penetrating trauma.¹⁰ Predicting these changes in trauma volume is a pressing question for the trauma system because personnel providing trauma care and those available for COVID-related critical care have a substantial degree of overlap. Most concerning is likely upswing in trauma volume with the push to “open the economy.”

Injury prevention efforts and programs to prevent trauma recidivism may be the first to be shuttered by trauma centers.

Surgeons, nurses, and social workers are being pulled to provide direct clinical care rather than their routine public health. Less time is being dedicated to alcohol screening and brief intervention and violence intervention programs. As we enter the more chronic phase of the pandemic, programs such as these are at highest risk to lose funding as some administrators may think they are nonessential services, much to the regret of trauma center physician leaders.

PREHOSPITAL CARE

With or without a pandemic, the frontline EMS providers are the backbone of a trauma system. Early responses from some states have suggested relaxing credentialing regulations to radically increase the availability of EMS personnel, but no public data yet exists to quantify EMS resilience and the effect of increased burdens of disease. Given the importance of rapid transport as a predictor for survival after trauma, will EMS systems be overburdened by COVID-19 patients and be unable to provide the same level of response for high-acuity trauma patients? EMS providers have a high exposure rate to COVID-19 positive patients and the potential loss of providers due to becoming positive is a real and potential threat to the long-term health of the EMS system.

Even if EMS teams are able to effectively transport patients, will trauma centers be available to receive them? In late March, the American College of Surgeons released guidance to local trauma directors acknowledging that trauma center capacity would likely be impacted by surging cases of COVID-19.¹¹ Anecdotally, trauma centers in some of the hardest hit areas have begun decisions on whether continuing to be a trauma receiving hospital is tenable with the current lack of inpatient capacity, particularly for patients needing ICU care.

Perhaps the greatest shift prompted by the COVID-19 pandemic has been increasing calls for early prehospital triage to termination of resuscitation for trauma patients unlikely to survive further resuscitative efforts. In the same report, the American College of Surgeons has encouraged local trauma systems to define clear criteria for such decision-making. Some states and jurisdictions are changing cardiopulmonary resuscitation protocols and limiting resuscitative efforts aimed at COVID-19 patients. Such considerations also align prehospital care with current evolving inpatient practices such as those in New York City hospitals that have stopped providing cardiopulmonary resuscitation in the event of cardiac arrest due to the heightened concern for aerosolized COVID-19 virus transmission during these efforts. Moral distress and burnout of our first responders is real and as the pandemic quiets, projected loss and dropout of EMS providers places the system in jeopardy.

POST-TRAUMA CENTER CARE

Trauma care after hospital discharge has always suffered from fragmentation and increased risk of lack of continuity and subsequent morbidity for patients.¹² In the times of this COVID-19 pandemic patients themselves do not wish to come to clinics or physician offices and most health systems have eliminated in-person routine follow-up visits when possible. Video-based telehealth visits or simply a telephone-based check-in for straightforward cases has become routine. This may not be enough for complex, multi-system trauma patients. Measuring the long-term physical, functional, and psychological outcomes of patients discharged during the pandemic may inform the value of such follow-up for future trauma patients.¹³

For patients needing inpatient acute rehabilitation or subacute skilled nursing facility placement, options are even more limited. Some centers require 1 or more negative COVID-19 tests before

acceptance for admission contributing to additional delays; and others are limiting capacity due to bed closures, staffing shortages, lack of staff training, and/or PPE. All of these issues will lead to increased hospital length of stay and potential for increased complications in severely injured patients

RESEARCH

Research has always been a cornerstone of the trauma center and was the first identifiable collateral damage casualty of the COVID-19 crisis. In nearly all settings, research efforts not related to COVID-19 have essentially stopped. Even health services researchers working on trauma have changed their focus, with many now getting involved in new COVID-19 projects. Although these approaches may increase our knowledge about COVID-19, the opportunity cost of stopping all other trauma and ACS research is real. The financial health of many universities and health systems will also likely limit nongrant funded research.

TRAUMA ECONOMICS

One of the most important future questions is how COVID-19 will affect trauma centers' finances and viability. Outside of trauma, health systems are already projecting huge losses stemming from the additional nonreimbursed costs of taking care of COVID-19 patients and lost volume of high-margin elective services.¹⁴ The COVID-19 pandemic will clearly affect the bottom line of trauma centers. Trauma service lines are generally net positive revenue generating for hospitals, but depend on a large volume of trauma admissions and their subsequent high-end surgical care (variable costs) to drive this benefit. If trauma admissions decline as some have observed, the fixed costs of maintaining a trauma service persist (clinical team, registry personnel). With the marked downturn in the economy and unemployment rates of over 20%, the loss of health care insurance coverage will accelerate which will further decrease trauma center profitability. Furloughs and salary reductions are already happening across the country at many hospitals. Many health systems are also putting in place spending or hiring freezes that make strategic planning for new projects and personnel difficult to implement. It is likely that popular but unfunded mandates such as trauma prevention programs and comprehensive mental health care (e.g. Post traumatic stress disorder [PTSD]) will be in jeopardy. As outlined previously, trauma registry staff and every member of the trauma center team will be scrutinized as to their contribution to the bottom line. Many trauma centers and systems are dependent on financial support from the state, regional, or motor vehicular mechanisms. As many states and municipalities are finding themselves in dire financial straits, money dedicated to the trauma system will also likely decrease. Over the past decade, the economy was healthy and there was an expansion of trauma centers across the country. It will remain to be seen if the economic downturn and financial obligations will result in trauma center closure. Although there is considerable debate as to how many trauma centers are necessary in a given location, it is recognized that rapid access to trauma center care saves lives and improves outcomes. As trauma centers often serve vulnerable and underserved populations as safety net hospitals, their financial wellbeing is necessary to support the health of those communities. There needs to be widespread recognition that trauma centers play a pivotal and vital role in the overall population health of the United States.

CONCLUSIONS

Trauma centers are a national resource and many of these same centers are key providers of COVID and non-COVID care during this global pandemic. The forced changes in our healthcare

system may threaten these centers' abilities to deliver trauma care during and after the pandemic. As outlined in the National Academies report titled "A National Trauma Care System: Integrating Military and Civilian Trauma Systems to Achieve Zero Preventable Deaths After Injury,"¹⁵ we must continue to strive for zero preventable deaths from injury and we cannot let trauma centers become collateral damage in our fight against COVID-19.

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