

Early Report from the Greater New York Chapter of the American College of Surgeons Committee on Trauma on the COVID-19 Crisis

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INTRODUCTION

The early "bottleneck" of the COVID crisis in the Greater New York City area was ICU capacity. This bottleneck prevented the flow of critically ill patients out of the Emergency Department, left critically ill patients at lower than ideal levels of care within the hospital, prevented full functionality of operating rooms, and quickly degraded the health system's ability to handle other non-COVID medical and surgical emergencies such as trauma, stroke, and myocardial infarction. Institutional Trauma Medical Directors identified this issue early into the incident but found it became difficult to keep ICU or ED resuscitation beds "for ready use" due to pressure from the unending influx of critical COVID patients.

I. INSTITUTIONAL ICU CAPACITY

INCREASED ICU DEMAND

- 1) The influx of COVID related ICU patients was *rapid, exponential, and increased daily. The daily increases persisted over weeks not days.*
- 2) To address the size and rate of the surge, institutions had to create new ICU capacity, often 200% to 300% of their baseline ICU beds.
 - **RECOMMENDATIONS**
 - i) Increasing ICU capacity should begin well in advance of the surge whenever possible and will need to continue well past the peak of the event.

INCREASING ICU CAPACITY

- 1) The cessation of elective surgery was helpful in freeing ICU capacity and resources that were already in existence. Although this was a necessary first step in planning for the COVID crisis, rapidly building and equipping NEW ICU capacity and resources was essential.
 - **RECOMMENDATIONS**
 - i. Pause elective surgery well before the expected surge in critically ill COVID patients.
 - a. As programs that previously funneled elective surgical patients into critical care areas are paused, the census of specialty specific ICUs will decrease quickly, freeing ICU beds and resources.
 - ii. Creating new ICU capacity is essential.

- a. Conversion of clinically active spaces to ICUs can be done rapidly and should be the first choice in increasing ICU capacity. Clinical units with pre-existing monitoring capability are ideal (PACU, post-procedure recovery areas, step down units, and operating rooms).
- b. Modification of non-clinically active space to patient care units should be started well in advance of the expected surge. Conversion of non-clinically active spaces took longer than expected, often taking several days to accomplish depending on the pre-existing space.
- iii. Closely evaluate the supply of essential ICU equipment and supplement as needed before your institution is involved in the local response to the COVID crisis. Understand that these supplies will be used up to 300% faster than routine institutional patterns.
 - a. Ventilators
 - b. Monitors
 - c. Pulse oximeters and sensors
 - d. CVVHD machines and supplies
 - e. Temporary Hemodialysis catheters
 - f. Oxygen tubing and tanks
 - g. Commonly used IV vasopressors, opioids, sedatives, and neuromuscular blocking agents

II. ICU STAFFING

- 1) Typical ICU staffing models were not sustainable.
- 2) A major rate limiting step in the care of critically ill COVID patients was staffing of newly created ICU beds.
- 3) Safety net hospitals with already tenuous nurse staffing models were at particular risk.
- 4) Utilization of residents and fellows for ICU staffing, often requiring rapid reorganization of previously scheduled rotations, was essential and lifesaving.

- **RECOMMENDATIONS**

- i. All ICU staff should be prepared for staffing models that were not previously acceptable.
- ii. High ICU nursing ratios can be supplemented by:
 - a. Offloading tasks such as documentation to non-ICU trained nurses
 - b. Elimination of non-essential nursing documentation demands
 - c. Decreasing all non-essential nursing tasks as much as possible
 - d. The use of non-unit based “teams” that help to offload ICU nursing intensive tasks:
 1. Proning teams
 2. Intravascular line teams
 3. CVVHD teams
- iii. Institutional, intensivist lead, ventilator teams can be used to review ventilator management, especially in non-intensivist led ICU units.
- iv. With the involvement of individual program directors, preplanning for a rapid mobilization of available residents and fellows for ICU staffing *should be accomplished before the institution is in a crisis*. The opportunity for house staff learning critical models of ICU care, leadership, and professionalism is invaluable.

- 5) ICUs needed to be staffed utilizing non-ICU trained physicians and advanced care providers. Integration of ICU-trained and non-ICU trained providers was critical in staffing of newly created ICU capacity. Although different models of integration were found to be effective, a basic principle was to match the acuity level of the patient population with the experience level of the ICU providers.

- **RECOMMENDATIONS**

- i) Institutions should preplan for the utilization of non-ICU providers in ICU environments.
 - (1) *Provider-based models* moved providers, not patients. Experienced providers moved throughout the institution into ICUs with high levels of acuity.
 - (a) The highest acuity patients tended to be admitted to newly created ICUs. Once a unit was populated and the patients stabilized, an “ICU Lite” team trained in this unit. After a brief training period, the “ICU Heavy” team pushed forward to establish a new ICU leaving the “ICU Lite” team to manage the established unit.
 - (2) *Patient-based models* moved patients, not providers. High acuity patients were moved throughout the institution into ICUs with high levels of ICU trained providers.
 - (a) The highest acuity patients were identified and transported to ICUs with “ICU Heavy” provider teams. Lower acuity patients were identified and transported to ICUs with “ICU Lite” provider teams.
 - (3) Although all teams need to have at least some level of ICU experienced providers, the ratio of ICU experienced to non-ICU experience providers on each team needs to be individualized for each ICU based on patient acuity.

III. MASS PRODUCTION OF CRITICAL CARE

- 1) Use of non-ICU experienced providers and nurses required rapid “mass production” of critical care.

- **RECOMMENDATIONS**

- i) Critical care of COVID patients should be rapidly protocolized.
- ii) All protocols need to be written in a clear & pragmatic way developed for non-ICU experienced providers.
- iii) Protocols should follow a “good enough” approach instead of striving for a more complex “perfect” model that is impossible to provide to all patients.
- iv) Interventions that are not able to be produced at scale (i.e. inhaled iNO, ECMO) should be carefully considered.
- v) Critical care protocols should be routinely discussed at short intervals (likely several times per week) among ICU leadership to review outcomes, adjust protocols, and understand the role of novel therapies.

IV. EMERGENCY DEPARTMENT

- 1) Critically ill patients presented to the ED in greater numbers and shorter time frames than expected. This surge quickly degraded overall capacity for trauma and other non-COVID emergencies.
- 2) The ability to “decant” the ED was *directly proportional to the speed at which new ICU beds could be created and staffed*. Many institutions’ emergency departments became overwhelmed as the rate of influx of new patients outpaced the ability of the institution to open new ICU beds.

- 3) New models of ICU organization were required to make patient flow from the ED to the ICU as efficient and rapid as possible.
 - **RECOMMENDATIONS**
 - i) Patients should be assigned to the next available ICU bed and moved quickly by ED staff immediately after initial stabilization.
 - ii) Bed assignments among ICUs should be done by a centralized logistics center.
 - iii) Previous ICU models *which differentiate ICU's into subspecialty units should be abandoned* and all ICU capacity centralized.

V. REVIEWING TRAUMA CENTER CAPACITY

- 1) Typical trauma center operations were not possible in the majority of centers
 - **RECOMMENDATIONS**
 - i) An assessment of the effect of the COVID crisis on trauma center operations should be done by the institutional Trauma Medical Director and Trauma Program Manager.
 - (1) This assessment should be documented for later review.
 - (2) Priority of critical trauma center functions versus less critical functions should be decided as trauma staff is redeployed to COVID related duties. Examples of non-critical trauma center functions that may be able to be paused are:
 - (a) Trauma outreach and prevention
 - (b) SBIRT
 - (c) Research activities
 - (d) Administrative meetings
 - (3) Trauma leadership should review specific data points for critical trauma center functions on a daily basis. Daily review should include:
 - (a) OR availability
 - (b) ICU availability
 - (c) ED resuscitation availability
 - (d) Blood bank availability
 - (e) X-ray, CT, Interventional Radiology availability
 - (f) General Surgery / Orthopedic / Neurosurgery team availability
- 2) Most trauma centers were not able to accept trauma transfers from non-trauma centers with the exception of high acuity injuries.
- 3) Trauma diversion was not possible given the geographic reach of the COVID crisis
 - **RECOMMENDATIONS**
 - i) Typical transfer patterns should be reexamined. Transfer of mild to moderately injured patients from non-trauma centers, although previously accepted, may not be possible with decreased trauma center capacity. Reconsider transfers of:
 - (a) Minor intracranial abnormalities on head CT
 - (b) Grade I / II solid organ injuries in stable patients
 - (c) Isolated rib fractures in stable patients
 - (d) Isolated non-operative pelvic fractures in stable patients
 - (e) Other injuries unlikely to require operative intervention

VI. ETHICS AND RESOURCE UTILITAZION

While different models for the allocation of resources during a health care crisis exist, a universal fundamental principle is that the same ethical guidelines should be applied equally to all patients. Given the number of different services and physicians who are involved in the care of critically ill patients, assuring this equality can be difficult in a pandemic crisis. Assuring an equitable and transparent system for allocation of resources was difficult during the COVID crisis.

- **RECOMMENDATIONS**

- i. Discussions concerning allocation of resources occurring *before* patient demand outstrips resources is the most effective way to avoid a “first come, first serve” strategy, which is antithetical to an equitable management of resources.
- ii. Resources should be continuously reviewed and communicated to front-line staff to assure that the best possible level of care is being provided given the resources available.

VII. SYSTEMS ISSUES

- 1) There was no integration of efforts across regions and healthcare systems. There was no specific guidance from New York State Government for trauma system maintenance. Capacity existed outside of the New York City area but traditional boundaries along governmental jurisdictions and across health systems did not allow for load balancing from high volume areas to other regions.

- **RECOMMENDATIONS**

- i. As much as the local geopolitical environment allows, prepare to preserve trauma capacity in your region. A unified leadership infrastructure that is able to receive and interpret information from multiple hospitals and health systems is important in an effort to preserve capacity for non-COVID time-sensitive medical and surgical emergencies, such as trauma, stroke, and myocardial infarction. This unified leadership infrastructure model is outlined in an ACS document which summarizes the principles of a regional medical operations center (RMOC). This unified leadership infrastructure, if set up in advance of the surge, can be helpful in coordinating care and providing shared information across the region. <https://www.facs.org/covid-19/clinical-guidance/rmoc-setup>.
 - ii. If the local geopolitical environment does not allow a unified regional leadership infrastructure, prepare to preserve trauma capacity in your health system. A unified leadership infrastructure within a health system that is able to receive and interpret information from multiple institutions is important in an effort to preserve capacity for non-COVID time-sensitive medical and surgical emergencies, such as trauma, stroke, and myocardial infarction.
- 2) At least for the first two weeks of a rapidly emerging regional health care crisis, do not expect significant additional resources from federal, state, or local governments.

VIII. NON-TRADITIONAL ALTERNATIVE CARE SITES (NTACS)

- 1) Regional capacity and trauma capability would have been better maintained if NTACS's, such as the USNS Comfort and Jacob Javits Center, were functional within the first weeks of the initial surge.
- 2) The initial inclusion/exclusion criteria for NTACS's was too restrictive to effectively help decant the hospitals in crisis. The early requirement for NTACS's to accept only COVID negative patients was impossible to operationalize during a pandemic crisis.

- **RECOMMENDATIONS**

- i. NTACS sites should be able to receive primary transports for less critically ill patients. Less time and effort would then be required to organize secondary transfers.
- ii. NTACS inclusion / exclusion criteria should be designed with an understanding of the dynamics of the local health care system crisis.
- iii. NTACS's deployed during a pandemic crisis should be configured to care for infected patients.