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Space, Staff, Stuff, and System

Keys to ICU Care Organization During the COVID-19 Pandemic



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The COVID-19 pandemic placed severe strain on hospitals. The high proportion of patients with COVID-19 who required organ support placed unprecedented demand on ICUs. Some hospitals implemented interventions to increase ICU capacity such as freeing up bed capacity by cancelling elective surgeries and redeploying staff.¹ Though several studies evaluated how well these emergency responses worked from a hospital perspective,² little is known about how these emergency responses were perceived by front-line providers. In this issue of *CHEST*, Vranas et al³ describe intensivists' perceptions of which ICU organization and care processes worked well and which did not and how the COVID-19 hospital responses differed between tertiary and community hospitals.

Thirty-three intensivists from seven tertiary and six community hospitals (that experienced early and/or large surges of patients with COVID-19) in the United States were interviewed about their perceptions on which ICU organizational changes were effective pandemic responses. The investigators conducted a rigorous qualitative analysis utilizing the "Four S" (ie, space, staff, stuff, and system) framework.⁴ Participants

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perceived that cancelling elective surgeries ("space") was helpful early in the pandemic and that those elective surgeries that were continued throughout subsequent COVID-19 surges offset hospital financial losses. Participants perceived that redeploying "staff" (eg, anesthesiologists and surgeons) and creating treatment teams (eg, intubation) improved workflow. However, participants from community hospitals did not have these specialized teams and relied on their existing staff to take on additional shifts. Participants described confusion around the type, the availability, and the agreed upon use of hospital-provided personal protective equipment ("stuff"). Last, participants perceived that cohorting patients with COVID-19 was helpful to conserve personal protective equipment and increase work efficiently but felt that restricting visitors was not helpful to the pandemic response ("system").

It is important to highlight that the qualitative work presented by Vranas et al³ was conducted during the first wave of COVID-19 and, as such, represents perspectives on hospitals' initial response to the COVID-19 pandemic. Subsequent waves of COVID-19, the emergence of the variants of concern, and widespread vaccination of clinicians and the public may have impacted people differently. The current study did not consider how ICU organizational changes affected patients, families, nurses (similarly redeployed to treatment teams),⁵ respiratory therapists, and other clinical staff who were also impacted by shifts in ICU care provision during the pandemic. The pursuit of palliative measures because of the low availability of resources may have impacted family members who, when involved with the goals of care discussion, may have chosen to use invasive ICU technologies to prolong life, regardless of patient prognosis.⁶ The perspectives in the current study are situated within a for-profit health care system and may not entirely extend to jurisdictions with publicly funded health care.

Like COVID-19, the evidence in this area is evolving quickly, and we are only beginning to understand the unintended consequences of ICU care reorganization during the COVID-19 pandemic. In terms of space, the cancellation of elective surgeries led to massive financial losses, estimated to be as high as \$22.3 billion.⁷ Staff shortages resulted in tiered staffing in tertiary care

hospitals, with shortages in nurses and respiratory therapists having major impacts.⁸ Although initially space was predicted to be in short supply, specialty-trained staff quickly emerged as the pandemic's most limited resource. Frequently changing personal protective equipment guidelines (stuff) and availability led to confusion and distrust among clinicians, who felt decisions were not based in science.⁹ Changes to the way care was provided at the system level generally were viewed positively, including cohorting patients who tested positive for COVID-19 and establishing command centers to coordinate care.¹⁰ For organizational changes to be successful, clear leadership and communication are essential. Frustration around a lack of transparency in pandemic administrative decision-making can be overcome by involving intensivists in the process.

The implications of ICU care reorganization during the COVID-19 pandemic continue to be uncovered. In addition to the financial implications, the backlog of surgeries may take months to years to catch up, extending already long wait times in many jurisdictions and resulting in substantial morbidity and death for patients unrelated to pandemic disease.¹¹ This also includes the complicated grief experienced by families and significant moral distress experienced by clinicians when hospital policies restricted family visitation and when patients died alone.¹² Perhaps unexpectedly, the COVID-19 pandemic positively affected the medical education of trainees. Trainees were restricted initially from caring for patients with COVID-19 in many hospitals; as understanding of COVID-19 improved and the need for qualified personnel increased, what emerged was a highly skilled trainee workforce with considerable experience caring for critically ill patients.

The personal impact of COVID-19, told through rigorous qualitative studies, grounds us in the reality experienced by those providers who cared for the sickest patients. The field of critical care medicine may benefit

from the lessons learned from reorganizing care during the COVID-19 pandemic, such as the creation of specialized teams to improve the efficiency and effectiveness of critical care. As the COVID-19 literature emerges, we will be closer to understanding the effect of ICU care reorganization during the COVID-19 pandemic on patients, families, and clinicians and will participate in early and evidence-based planning for future infectious disease outbreaks.

References

1. Mathews KS, Seitz KP, Vranas KC, et al. Variation in initial U.S. hospital responses to the coronavirus disease 2019 pandemic. *Crit Care Med*. 2021;49(7):1038-1048.
2. Kerlin MP, Costa DK, Davis BS, Admon AJ, Vranas KC, Kahn JM. Actions taken by US hospitals to prepare for increased demand for intensive care during the first wave of COVID-19: A National Survey. *Chest*. 2021;160(2):519-528.
3. Vranas K, Golden SE, Matthews KS, et al. The influence of the COVID-19 pandemic on ICU organization, care processes, and frontline clinician experiences: a qualitative study. *Chest*. 2021;160(5):1714-1728.
4. Anesi GL, Lynch Y, Evans L. A conceptual and adaptable approach to hospital preparedness for acute surge events due to emerging infectious diseases. *Crit Care Explor*. 2020;2(4):e0110.
5. Uppal A, Silvestri DM, Siegler M, et al. Critical care and emergency department response at the epicenter of the COVID-19 pandemic. *Health Aff (Millwood)*. 2020;39(8):1443-1449.
6. Cook DJ, Giacomini M, Johnson N, Willms D. Life support in the intensive care unit: a qualitative investigation of technological purposes. Canadian Critical Care Trials Group. *CMAJ*. 1999;161(9):1109-1113.
7. Bose SK, Dasani S, Roberts SE, et al. The cost of quarantine: projecting the financial impact of canceled elective surgery on the nation's hospitals. *Ann Surg*. 2021;273(5):844-849.
8. Wahlster S, Sharma M, Lewis AK, et al. The coronavirus disease 2019 pandemic's effect on critical care resources and health-care providers: a global survey. *Chest*. 2021;159(2):619-633.
9. Hoernke K, Djellouli N, Andrews L, et al. Frontline healthcare workers' experiences with personal protective equipment during the COVID-19 pandemic in the UK: a rapid qualitative appraisal. *BMJ Open*. 2021;11(1):e046199.
10. Keene AB, Shiloh AL, Eisen L, et al. Critical care surge during the COVID-19 pandemic: implementation and feedback from frontline providers. *J Intensive Care Med*. 2021;36(2):233-240.
11. Soreide K, Hallet J, Matthews JB, et al. Immediate and long-term impact of the COVID-19 pandemic on delivery of surgical services. *Br J Surg*. 2020;107(10):1250-1261.
12. Cook DJ, Takaoka A, Hoard N, et al. Clinician perspectives on caring for dying patients during the pandemic: a mixed-methods study. *Ann Intern Med*. 2021;174(4):493-500.