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Evidence-Based Practice When the Evidence Changes Daily: Lessons From Stanford in Building a Critical Care Task Force During COVID-19 (Stanford, 6/10)

Andrea Jonas, MD, Rebeca A. Aslakson, MD, PhD, Meghan Ramsey, MD, Kristan Staudenmeyer, MD, Arthur Sung, MD, Jenny Wilson, MD MSc, Angela Rogers, MD, MPH, Stanford University

Contact: Andrea Jonas andreajonas@stanford.edu

Abstract

What is the message? Stanford Hospital implemented a COVID-19 Critical Care Task Force (CCTF) to provide real-time institutional and regional guidance on patient care and surge planning during the COVID-19 pandemic.

What is the evidence? The authors describe the process of developing the task force.

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Creating a Critical Care Task Force: Meeting an Urgent Need

In early March 2020, the growing number of COVID-19 cases in Santa Clara County in California suggested the potential for a major surge in intensive care unit (ICU) patient volume. In response Stanford Hospital took urgent action: training staff, ordering supplies, and developing Stanford's COVID-19 response team. We describe here the process pathways by which Stanford Hospital implemented a COVID-19 Critical Care Task Force (CCTF) to provide real-time institutional and regional guidance on patient care and surge planning during the COVID-19 pandemic.

Key to the success of Stanford's CCTF was leveraging the in-house expertise cultivated over decades, including clinician leaders, data scientists, and a broad, multidisciplinary team of hospital employees committed to delivering excellent patient care in the face of extraordinary circumstances. While timely county and state-level shelter-in-place orders mitigated the patient surge seen at Stanford, the lessons garnered in readiness and communication across multiple disciplines are broadly applicable.

Laying The Foundation Of A Covid-19 Critical Care Task Force

The formation of the CCTF stemmed from two elements core to Stanford's hospital ethos: a culture of multidisciplinary collaboration coupled with a clear central organizing structure. Stanford's hospital leadership formed the Clinical Oversight Resource Team (CORT) committee to serve as a single entity to oversee the COVID-19 response. The CORT committee included key stakeholders from Stanford's physician and nursing leadership, and ensured coordination of the many elements of COVID-19 preparations, including laboratory testing, occupational health, supply chain, workforce management, and patient care practices and protocols.

Central to CORT's mission was enabling individual hospital departments to develop task forces that would each lead their respective department through the rapidly evolving clinical landscape. One such committee was the CCTF, developed under CORT's guidance, and empowered to serve as a cornerstone group in leading Stanford's ICU response (Figure 1).

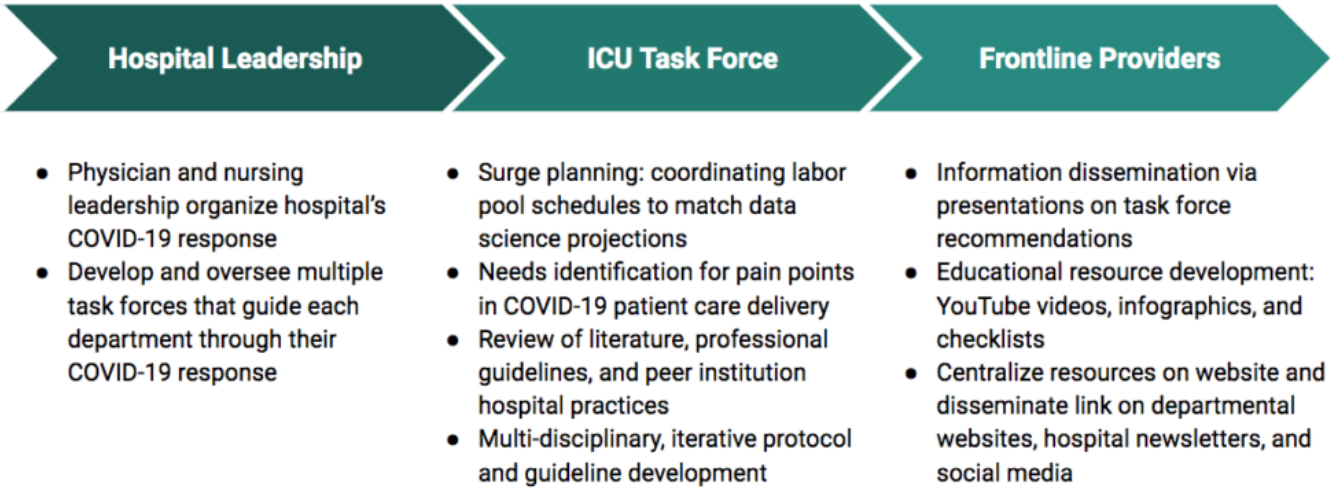

Figure 1: ***Organizational chart revealing tasks key at each level of the hospital leadership structure to achieve timely dissemination of protocols and practices for the hospital's COVID-19 response***

Stanford's CCTF provided clinical guidance to the institution's provision of critical care, issuing consensus-based recommendations from a collaborative, multidisciplinary team. Ultimately growing to include over sixty members, the CCTF included representatives from over a dozen departments, including intensivists from multiple specialties, nursing and respiratory therapy, pharmacy, ethics, and infectious disease at Stanford Hospital (Table 1).

Pulmonary & Critical Care	19
Anesthesia Critical Care	8
Emergency Department	5
Nursing	5
Respiratory Therapy	4
CV-ICU/Cardiac Anesthesia	3
Surgery Critical Care	3
Ethics	2
Hematology	2
Infectious Disease	3
Neurology Critical Care	2
Palliative Care	2
Pediatrics	2
Pharmacy	2

Table 1 ***Breakdown of multidisciplinary representation by department on Stanford's CCTF.***

Task force members met virtually up to three times weekly to review the COVID-19 literature, clinical trials, and professional society clinical guidelines to generate expert consensus recommendations. The task force also solicited informal sources of data, including expert consensus on best clinical practices from peer institutions and guidance from colleagues at epicenters hit early in the pandemic (including China, Italy, and New York).

Through these collaborative efforts, the task force developed and implemented surge planning

for the ICU, produced over two dozen protocols and checklists for the care of COVID-19 patients, and developed and disseminated web-based COVID-19 educational resources for the entire hospital community. These resources are continually reviewed and updated to reflect rapidly emerging evidence on critical illness due to COVID-19.

Innovations in Data Science for Surge Planning

Real-time data analytics and a close relationship with the data science team proved crucial for ICU surge planning by the CCTF. Twice weekly, case counts and model predictions were reviewed with the task force to marry computer modeling of local case prevalence data with the observed number of cases seen in the Stanford hospital network. Contributing key data such as ICU length of stay, CCTF members facilitated high fidelity modeling of expected hospital and ICU census for future weeks.

This modeling data allowed Stanford to anticipate several weeks in advance when ICU capacity would be exceeded and to develop appropriate surge response strategies. As the beneficial impact of local shelter-in-place orders became apparent, Stanford's data modeling predicted a steady decrease in new ICU admissions, allowing deactivation of the surge team. Data modeling continues in real-time as of June 2020, incorporating Stanford's hospital census, aggregate laboratory testing results, and public health data of the surrounding counties. In this capacity, the CCTF continues to collaborate with data scientists to anticipate potential future surges in regional COVID-19 prevalence.

Scheduling of surge team providers required communication across multiple disciplines. A core leadership team consisting of intensivists, nurses, and respiratory therapists mapped out the labor needs for multiple surge scenarios. Anticipating that patient volume could rapidly outstrip labor pool capacity, alternative staffing models (such as the Society of Critical Care Medicine's pandemic response strategy) were developed and criteria for activating such strategies were agreed upon. Throughout the process, providers had access to the surge schedule, and projected dates for surge activation, allowing individuals to know whether they were "on deck" for COVID-19 surge-related clinical duty. Though Stanford's patient surge was not dramatic, the multidisciplinary approach allowed Stanford to seamlessly activate its ICU surge teams once capacity was reached.

Clinical Care: Generating and refining protocols in a rapidly changing landscape

A core CCTF responsibility was the development of clinical pathways for evidence-based practice to promote a consistent approach throughout the hospital. Intense scientific and public interest in COVID-19 led to exponential growth in observational studies and clinical trials focused on COVID-19 patients. Rapid roll-out of numerous clinical trials was mirrored by the publication of clinical guidelines and expert consensus statements which were sometimes contradictory and often rapidly outdated. In the face of a rapidly evolving clinical landscape, the CCTF was tasked with charting a course for the provision of up-to-date, evidence-based best practices for COVID-19 patients in Stanford's ICUs.

Leveraging the multi-disciplinary expertise brought by the task force members, the CCTF generated protocols to guide all aspects of ICU care at Stanford Hospital. Topics included code team staffing, personal protective equipment (PPE) requirements for ICU procedures, intubation and ventilator strategies for COVID-19 patients, and criteria for use of interventions like non-invasive positive pressure ventilation, proning, and extracorporeal membrane oxygenation. Each protocol was drafted by a multi-disciplinary subcommittee, composed of 2-5 task force members.

Subcommittees completed relevant review of existing literature, professional guideline recommendations, and surveyed practices at peer institutions. Ultimately, each subcommittee generated a 1-2 page document summarizing protocol recommendations along with the rationale and supporting literature. Completed protocols were discussed with the entire CCTF membership, allowing time for input and recommendations from the wider CCTF audience, before ultimately being sent to the CORT committee for final approval and dissemination (Figure 2).

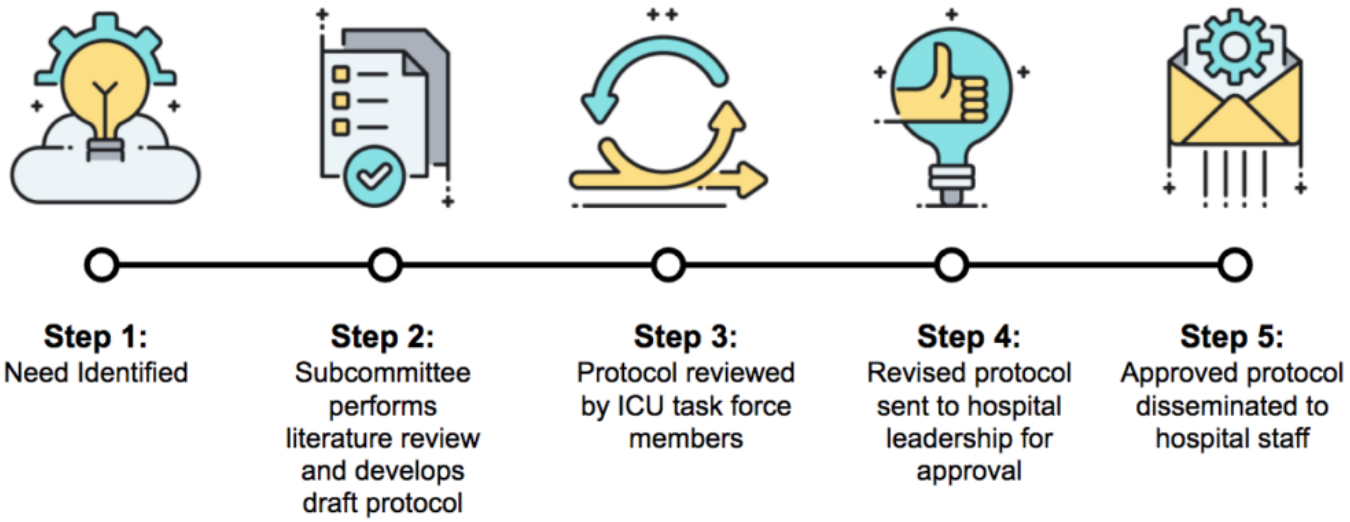

Figure 2: ***Overview of protocol development, from need identification through iterative review process to approval and dissemination.****

Source:** ***Icons made by Flat Icons from www.flaticon.com.

Through this process, the CCTF generated over two dozen protocols pertaining to the care of the critically ill COVID-19 patient. The task force continues to evaluate emerging data regarding optimal COVID-19 critical care practices and continually modifies and updates available protocols and educational resources. This is accomplished through delegation to individual subcommittees, which ensures continued updating as needed of protocols, with revisions discussed by the entire CCTF and ultimately approved by CORT.

Disseminating Information: Widespread sharing for point of care access

Rapid protocol development by the CCTF required equally rapid dissemination of knowledge to front-line providers. CCTF resources were shared broadly within the institution: CCTF protocols were announced in multiple departmental and intra-institutional newsletters and emails; posted

on the hospital intranet; shared as a resource in diverse institutional training programs; referenced during weekly Department of Medicine grand rounds (which also frequently included presentations by CCTF leadership); and broadcast on institutional social media platforms.

To meet the needs of front-line providers, the CCTF recognized the need to disseminate resources in an easy-to-use, widely-accessible format. Recommendations and guidelines were posted to a centralized website, which is both searchable and externally available to support front-line providers in real-time (Figure 3). Examples of available resources include educational videos on PPE donning/doffing, infographics on modalities for oxygen support for COVID-19 patients, a “survival guide” for non-intensivist physicians working in the ICU environment, and step-by-step guides for patient proning. The website is formatted to be accessible on mobile devices, with the intention of serving as an “in the pocket” summary of task force recommendations for point of care use.

Website link: https://sites.google.com/view/stanfordcovid/home

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Use of Non-Invasive Positive Pressure Ventilation (NIPPV) in COVID-19+ Patients and PUI

Non-invasive Positive Pressure Ventilation (NIPPV)

*We do **not** currently recommend NIPPV for patients with worsening hypoxemic respiratory failure due to COVID-19. However, in recognition of medical complexity and appropriate care for patients with pre-existing conditions, NIPPV may be considered in select patients provided appropriate equipment and PPE are used.*

PUI or confirmed COVID-19 patients who may benefit from NIPPV*

- Patients who require home NIPPV
    - Continue home settings; if worsening or requiring increased support, consult MICU and consider intubation.
- Patients with cardiogenic pulmonary edema
- COPD or asthma patients with hypercapnia or increased work of breathing
- Neuromuscular disease patients (addressed in separate protocol)
- Patients with profound neutropenia who fail HFNC but do not require immediate intubation

** As determined by attending physician, MICU consultation recommended.*

Equipment and isolation/PPE

- In-line HEPA filter for NIPPV (see figures A and B below)
- Full face mask. No nasal pillows.
- Airborne and droplet precautions with n95 mask + goggles or face shield in addition to contact precautions.

Rationale:

NIPPV

The use of NIPPV may increase risk of aerosol generation, and is not the modality of choice for supporting patients with acute hypoxemic respiratory failure not due to CHF. However, certain COVID-19 patients and PUI have pre-existing conditions that require NIPPV, or may have respiratory distress due to conditions other than COVID-19. The above guidelines are intended to allow the use of NIPPV in select patients only.

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3. Frat JP, et al. High-flow Oxygen through nasal cannula in acute hypoxemic respiratory failure. N Engl J Med 2015; 372:2185-2196.
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Figure 3: ***Sample protocol on non-invasive positive pressure ventilation for front-line use.***

Implementing real-time systems-level change

Rapid-cycle communication with Stanford leadership allowed the CCTF to implement real-time systems-level changes in patient care. Beyond protocol implementation impacting front-line care delivery, the CCTF identified and addressed systems-level issues pertaining to the delivery of care. For example, as the census of COVID-19 positive ICU patients grew, so did calls to cohort all COVID-19 patients into a single ICU ward to conserve PPE and limit potential contamination within the hospital building. The clear path between CCTF and hospital leadership through the CORT committee enabled rapid establishment of a cohorting structure. Further examples of rapid-cycle systems-level changes included the restructuring of labor pools to meet the needs for ICU surge planning, implementation of a COVID-19 airway team, roll out of a virtual patient video monitoring system in the ICU, and approval for equipment ordering to meet the unique ICU needs of COVID-19 patients.

Measuring the Impact of the Critical Care Task Force

Several measures demonstrate the impact of the CCTF's recommendations and resources. At peak utilization, the CCTF website had over 80 daily unique visitors, and has amassed over one thousand page views. The CCTF YouTube video demonstrating proper donning and doffing of PPE has garnered over 800 views. The impact of the task force has been felt regionally, as Bay Area community hospitals have reported referencing CCTF guidelines in developing their own protocols for care of COVID-19 patients.

Bringing The Lessons Forward: Continued Growth

A multidisciplinary, collaborative approach was required to meet the rapidly developing challenges posed by COVID-19. Frequent communication across multidisciplinary teams served as the foundation of Stanford's COVID-19 response, and an iterative, collaborative process allowed rapid progress. The success of the CCTF was built on the foundation of institutional

support and a culture of collaborative, multidisciplinary care, and provides one model for hospital preparations for a surge in critically ill patients.

Glossary of Terms

CCTF Critical Care Task Force

CORT Clinical Oversight Resource Team

ICU Intensive Care Unit

PPE Personal Protective Equipment

References

https://www.medrxiv.org/content/10.1101/2020.03.26.20044842v3

https://www.medrxiv.org/content/10.1101/2020.03.24.20042762v1