The Minnesota Critical Care Working Group 2

Crisis Conditions During the COVID-19 Pandemic, July 2021 through March 2022

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BACKGROUND: The Minnesota State Healthcare Coordination Center requested that the Minnesota Critical Care Working Group (CCWG) and Ethics Working Group (EWG), comprising interprofessional leaders from Minnesota's 9 largest health systems, plan and coordinate critical care operations during the COVID-19 pandemic, including the fall 2021 surge.

RESEARCH QUESTION: Can a statewide working group collaboratively analyze real-time evidence to identify crisis conditions and to engage state leadership to implement care processes?

STUDY DESIGN AND METHODS: The CCWG and EWG met via videoconferencing during the severe surge of fall 2021 to analyze evidence and plan for potential crisis care conditions. Five sources of evidence informed their actions: group consensus on operating conditions, federal teletracking data, the Medical Operations Coordination Center (MOCC) patient placement data, and 2 surveys created and distributed to hospitals and health care professionals. The group developed and recommended processes to mitigate the conditions and engaged statewide leadership for support.

RESULTS: Evidence of crisis conditions included rising numbers of patients with COVID-19, tertiary care centers with difficulty accepting transfers (including emergencies), severe emergency department crowding, activation of ICU allocation teams, and low patient placement rate at the Minnesota MOCC. A statewide hospital survey demonstrated numerous staffing adaptations, expansion of telemedicine, and delay of nonemergent procedures. A survey of health care professionals revealed instances of poor patient outcomes, bedside rationing, implicit triage, and moral distress. Leadership engagement resulted in public messaging, although no change in how ICU care was allocated, nor were transfers managed.

INTERPRETATION: The CCWG collected and analyzed evidence demonstrating crisis conditions and health care professional moral distress during the fall 2021 COVID-19 surge. However, the group had a limited impact on care processes. This article analyzes the group's efforts. It includes recommendations for researchers and policy makers.

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KEY WORDS: allocation of scarce resources; COVID-19; crisis conditions; crisis management; critical care; ICU strain; nonbeneficial care; surge

Take-Home Points

Study Question: Can a statewide Critical Care Working Group (CCWG) collaboratively develop crisis condition surge evidence and critical care planning while engaging state leadership to implement care processes?

Results: Five sets of evidence demonstrated crisis conditions in November 2021, leadership engagement did not result in allocation of ICU care without legal or regulatory protections, and ICU admissions were undertaken in a first come, first served methodology with accompanying health care professional moral distress.

Interpretation: Despite evidence establishing crisis conditions, CCWG had limited impact on care processes and did not result in state-supported resource allocation declarations or legal protections.

The Minnesota Critical Care Working Group (CCWG) and Ethics Working Group (EWG) focused on developing pandemic processes and practices through statewide leadership consensus among the 9 largest critical care programs.[1] Anticipating a severe surge similar to New York City[2,3] and Italy,[4] the CCWG and EWG worked with the Minnesota Department of Health (MDH) and members of the Minnesota COVID Ethics Collaborative (MCEC)[5] to plan for crisis conditions, defined as inadequate resources causing increased risk of morbidity and mortality.[6,7] Crisis conditions were averted during the first pandemic year. However, during fall 2021, COVID-19 hospitalizations surged, and contingency strategies were at their limits.[1,8]

This article details actions that the CCWG and EWG pursued in collaboration with the MDH to collect and analyze surge evidence and to influence care processes during the fall 2021 surge.[1] Recommendations are provided for future actions and research objectives for responding to ICU crisis conditions. This account is one of the few reports of a coordinated statewide critical care crisis response during the fall 2021 COVID-19 surge.[1,9]

Study Design and Methods

The CCWG and EWG function has been described.[1,8] The State Emergency Operations Center and State Healthcare Coordination Center were demobilized with the expiration of Minnesota's peacetime emergency on July 1, 2021.[10,11] State operations transitioned back to the MDH and were housed in the COVID-19 Response Bureau.[1,12] The CCWG functioned independently in coordination with the MDH leadership and Minnesota's Medical Operations Coordination Center (MOCC). The Minnesota Hospital Association president acted as intermediary providing access to health system chief executive officers (CEOs).

Minnesota previously created ethical and operational guidance for crisis conditions and adapted it for COVID-19 with input from the MCEC.[13,14] The EWG consulted with MCEC leaders to use this ethics guidance, other crisis standards of care (CSCs) and triage recommendations,[15-17] and COVID-19 outcomes data[18,19] to create the Minnesota Clinical Allocation Framework (hereafter, the allocation framework) during the spring of 2020.[20] The allocation framework adhered

ABBREVIATIONS: CCWG = Critical Care Working Group; CEO = chief executive officer; CSC = crisis standard of care; ED = emergency department; EWG = Ethics Working Group; MCEC = Minnesota COVID Ethics Collaborative; MDH = Minnesota Department of Health; MOCC = Medical Operations Coordination Center; SAT = Scientific Advisory Team

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to the MCEC-recommended ethical framework adopted by the MDH for allocation of critical care resources during crisis conditions.[13] It was not implemented during fall 2020 because the state government and health care organizations took steps to decrease transmission of COVID-19 and increase hospital capacity[21,22] and was revised again during fall 2021 (e-Table 1).[23] EWG members also consulted with MCEC leaders to revise ethical guidance for identifying crisis conditions and to suggest potential guidance for expedited conflict resolution and decision-making regarding futile, potentially inappropriate, and nonbeneficial treatment, which was included with the revised 2021 allocation framework.[24]

Five sources of evidence informed the CCWG's work during the fall 2021 surge (Table 1).[8,25,26] First, the CCWG and EWG members shared information about conditions within their health care systems, creating a foundation for consensus and baseline operating conditions. Second, the CCWG and EWG members monitored federal teletracking data (Figs 1, 2).[1,8,25,26] The third source of evidence was MOCC patient placement data (Table 1, Fig 3).[8] The fourth and fifth evidence sources were surveys designed and administered to characterize the situation further.

The first survey (developed by MDH employees A. W. and E. M.) was a crisis continuum survey requesting data from Minnesota hospitals. The survey was emailed by Regional Health Care Coalition Preparedness Coordinators to 128 acute care Minnesota hospitals. Regional health care preparedness coordinators worked with hospital contacts, including chief executive, nursing, and operating officers; clinical leadership; and emergency preparedness leaders to assist answering survey questions and to ensure that 1 survey was completed per facility. The survey was emailed on September 24, 2021, and closed October 7, 2021, with completion by 112 of 128 hospitals (87.5%) (Table 2, Fig 4). Survey responses were summarized as number (percentage) overall and within 61 critical access and 49 noncritical access hospitals (ie, larger hospitals); 2 hospitals did not indicate critical access status.[28] CCWG and MDH leaders were concerned regarding the disproportionate impact of the COVID-19 pandemic on less-resourced critical access hospitals. The raw survey data were presented in October 2021, with statistical analysis completed in preparation of this article. Response frequencies were compared using χ^2 tests of independence for questions with ≥ 3 possible responses and difference in proportions tests for questions with only 2 possible responses. Differences in response frequency for a given question were considered statistically significant if the

TABLE 1] Five Sources of Evidence of Crisis Conditions, July-December 2021

- CCWG consensus criteria
  - Tertiary care hospitals having increasing difficulty accepting ICU transfers from community hospitals
  - Severe ED crowding with inordinate boarding times for patients awaiting ICU admission (especially patients with ventilators, receiving vasopressors, or both)
  - Allocation officers or teams managing prioritization for ICU admission in some health care systems
- Federal teletracking data (Figs 1, 2)[25,26]
- MOCC placement data: ability of MOCC to place ICU patients and number requests (percent success identifying ICU bed)[8] (Fig 3)
  - July 2021: 46 (87%)
  - August 2021: 229 (60%)
  - September 2021: 325 (30%)
  - October 2021: 499 (23%)
  - November 2021: 470 (11%)
  - December 2021: 555 (8%)
- MDH Crisis Continuum survey (September 24-October 7, 2021) (Table 2, Fig 4)
- Metro Crisis Conditions survey to health care professionals (November 16-24, 2021) (Table 3, e-Tables 2, 3)

CCWG consensus criteria were determined by CCWG and EWG consensus during fall 2021 conference calls; federal teletracking data (Figs 1, 2)[25,26]; MOCC ability to place patients in an ICU, previously reported (Fig 3)[8]; the MDH Crisis Continuum survey (Table 2, Fig 4) and Metro Crisis Conditions survey (Table 3, e-Tables 2, 3) as discussed in Methods. Critical Care Coordination Center (C4) is the name of Minnesota's MOCC. CCWG = Critical Care Working Group; ED = emergency department; EWG = Ethics Working Group; MDH = Minnesota Department of Health; MOCC = Medical Operations Coordination Center.

P value was $< .05$. No adjustments were made for multiple comparisons. All analyses were conducted using R version 4.2.1 software (R Foundation for Statistical Computing).

The second was a crisis conditions survey with 5 questions gathering categorical data on professional roles and responses to scarce resource allocation (e-Tables 2, 3). Included were 4 open-ended questions requesting experiences and perceptions regarding substandard care, ad hoc rationing, health care workers' moral distress, and resource scarcity (Table 3, e-Table 3). The Metro Health and Medical Preparedness Coalition regional health care preparedness coordinator (S. M. K.) emailed a survey link to 302 members of the Metro Health Care Coalition (Twin Cities), all of whom were hospital-based professionals. The survey also was shared with the regional health care preparedness coordinators of the 7 other Minnesota Health Care Coalitions, although it is unknown which regions emailed it to members nor how many responded. The survey went out on November 16, 2021, and closed November 23, 2021, with 63 responses received.

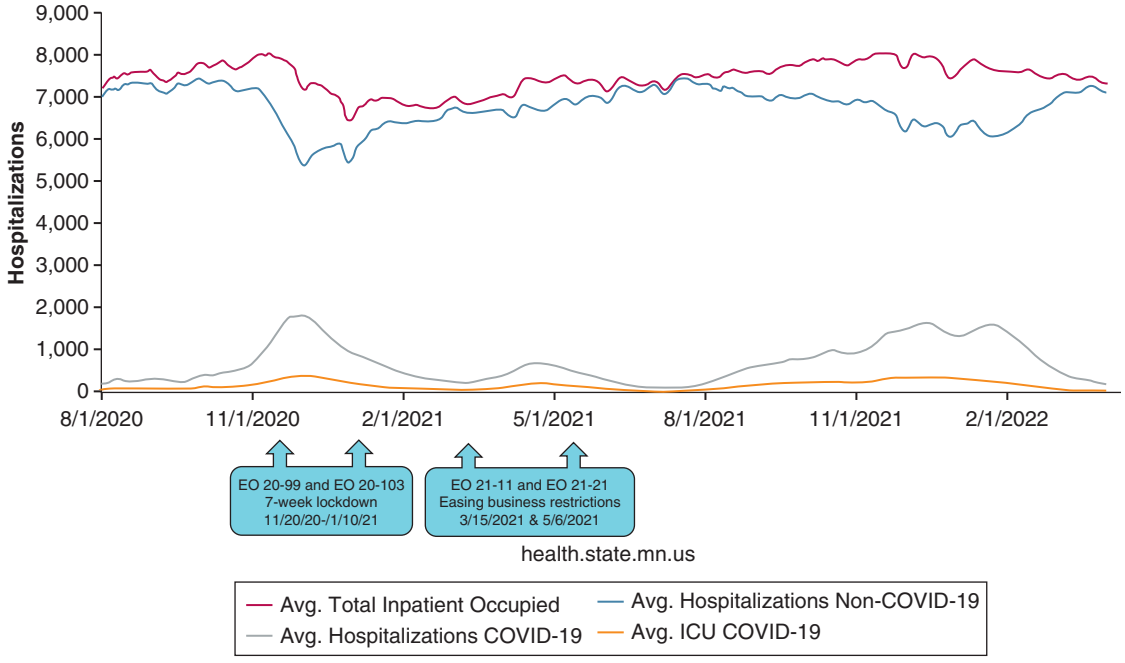

Figure 1 – *Graph showing average weekly hospitalizations (all inpatients; patients with and without COVID-19; and patients with COVID-19 in the ICU) from August 1, 2020, through March 31, 2022. Each data point is a weekly average (Monday-Sunday) for each variable, which was chosen to facilitate a smoother graphic presentation of the data. These curves were constructed using federal teletracking data for occupied bed spaces, which most likely represented maximum bed availability especially during severe surge periods. Federal teletracking data also tracked staffed bed spaces, which for Minnesota were consistently greater than occupied bed spaces and may have represented a theoretical maximum had staffing (or other) resources been more available.*[25,26,27] *The COVID-19 ICU hospitalization curve mirrors the shape of the COVID-19 hospitalization curve when viewed on a larger scale. Also shown on the horizontal axis is the 7-week interval during which businesses largely were closed because of the Minnesota governor's EOs, November 20, 2020, through January 10, 2021.*[22] *The Minnesota governor's EOs easing business restrictions (March 15, 2021) and rescinding most COVID-19 restrictions (May 6, 2021) also are shown.*[10] *It is noteworthy that non-COVID-19 hospitalizations declined corresponding with the surge of COVID-19 hospitalizations, especially in fall 2020 and fall 2021. This suggests nonemergency surgeries and procedures declined and seemed to match the rising COVID-19 patient surges, despite no Minnesota governor's EO mandating this. Only one such EO was issued in March 2020 that expired later that spring.*[22] *Figure courtesy of the Minnesota Department of Health and reprinted with permission from Baum et al.*[8] *Critical Care Coordination Center (C4) is the name of Minnesota's Medical Operations Coordination Center. Avg = average; EO = executive order.*

The CCWG engaged statewide leaders to provide updates, to request assistance, and to recommend strategies to expand ICU capacity and to allocate resources. Leaders included the Minnesota Hospital Association president, who coordinated meetings with large health system CEOs and a group of smaller-system CEOs not affiliated with tertiary care centers; the Science Advisory Team (SAT) from the MDH, a standing medical advisory group for resource-strained situations; and MDH leadership.

The CCWG established a pandemic severe surge best practice regarding prioritization of ICU admissions in December 2021 (Table 4). Like fall 2020, this required discussion at 2 meetings before formal consensus adoption.[1] CCWG members participated in 2 debriefings (so-called hotwash sessions) in April and May 2022 that were facilitated and summarized by MDH staff. The sessions' goals were to identify the strengths of the team and improvements for future planning.

Results

Evidence of Crisis Conditions

COVID-19 hospitalizations and ICU admissions rose during August 2021 (Fig 1). The CCWG and EWG member organizations implemented contingency measures as during the fall 2020 surge.[1] During September 2021, CCWG and EWG members observed severe strain within their tertiary care centers, leading some to prioritize transfers only from hospitals within their own systems. Strain responses also included severe ED crowding with long boarding times for patients awaiting ICU admission; allocation officers or teams activated to prioritize ICU admission in some systems; and intensive care delivered or continued in nontraditional care areas (eg, EDs or critical access

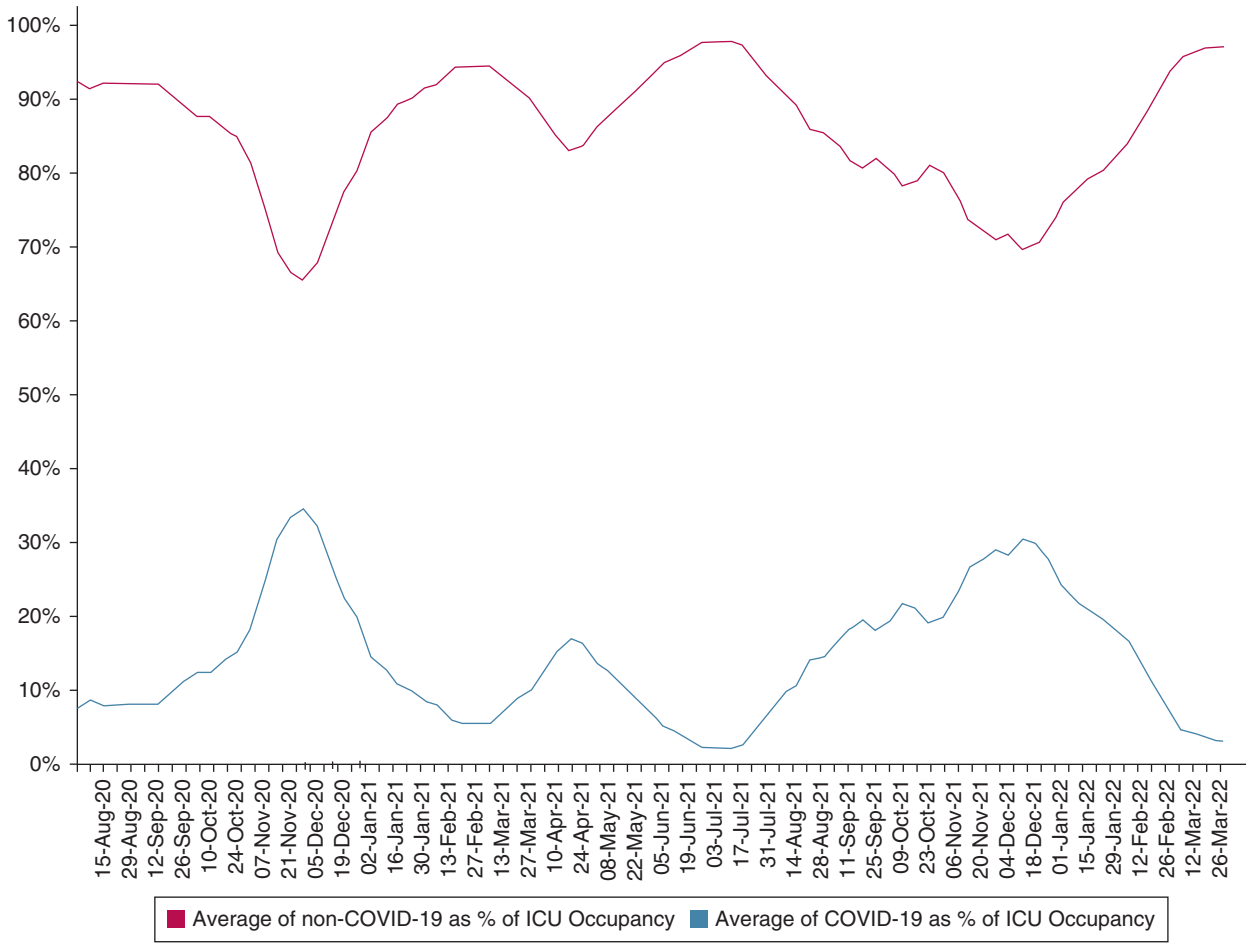

Figure 2 – *Graph showing the total numbers of occupied Minnesota ICU beds partitioned by percentage of patients with COVID-19 vs those without COVID-19 (see also Fig 1); all percentages add to 100%.*[25,26] *As the number of patients with COVID-19 in the ICU increased, a commensurate decrease in patients without COVID-19 in the ICU occurred, particularly striking during the fall 2020 and fall 2021 surges. Critical Care Working Group members attributed this to a decrease in the inpatient population without COVID-19, especially because of a decrease in nonemergent procedures, although it also may have been the result of a higher acuity of patients with COVID-19 or the Minnesota population intentionally avoiding hospitals with public knowledge of current severe surge conditions. The data points chosen on these graphs are each a weekly average (Monday-Sunday) to smooth the data curves over time. Graph courtesy Minnesota Department of Health.*

hospitals). The MOCC was unable to place all ICU requests, something that had not occurred previously (Table 1, Fig 3).[1,8] CCWG and EWG member consensus was Minnesota was in contingency conditions and crisis conditions at times.

The MDH Crisis Continuum survey data (Table 2) showed nearly one-quarter of the organizations (23.4%) with at least 16% unfilled staffing shifts in the preceding 14 days, and about the same number (23.6%) with at least 16% of unfilled patient care positions. Health care organizations used strategies to increase ICU capacity and manage staffing shortages.[1] Importantly, all 10 tactics to extend staff were used, with larger hospitals (including tertiary care) more significantly impacted in eight of the 10 categories. Additionally, staff hours increased > 150% in 12% of organizations and the nurse to patient ratio increased > 150% in 8% of organizations. These data (Fig 4) supported contingency conditions in Minnesota with greater overall strain on larger hospitals.

Delay of nonemergent procedures predominated in larger hospitals, also observed by CCWG and EWG member organizations and consistent with federal teletracking (Fig 1).[1,8,25,26] Evidence suggesting crisis conditions included activation of triage or ethics teams, or both, for resource allocation (21%), allocation of hospital and ICU admissions (15% and 11%, respectively), and some patients waiting > 24 hours for ICU admission (18%) (Table 2).[1] The Metro Crisis Conditions survey included 57.1% clinicians, 1 ethicist,

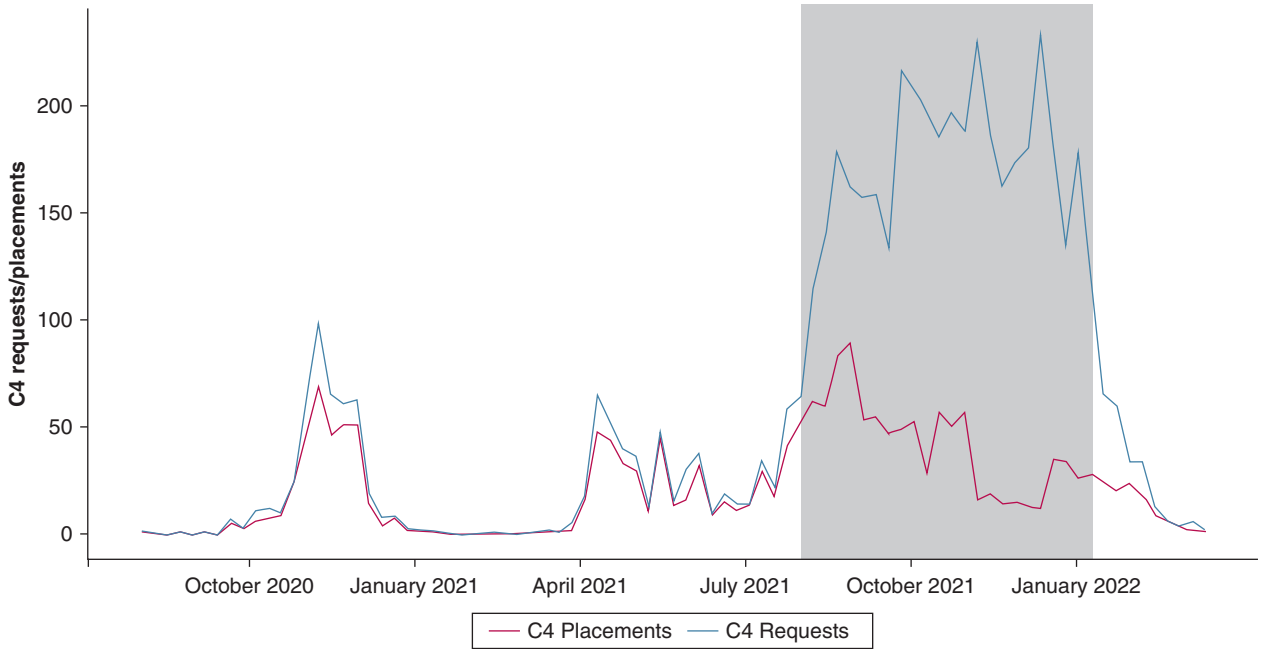

Figure 3 – *Graph showing weekly C4 placement results, August 1, 2020, through March 31, 2022, including total requests and total placements and time series analysis of the data. Each data point is a weekly average (Sunday-Saturday) for each variable. The shaded period corresponds to the weeks of August 1, 2021, through January 9, 2022, for which the number of placements is greater than the number of requests as determined by the changepoint analysis.*[30] *The difference in the number of C4 requests and placements averaged 4.49 during the fall 2020 surge (August 2, 2020-July 31, 2021) and peaked at 132.82 during the fall 2021 surge (August 1, 2021-January 15, 2022) before going back down to 12.78 starting from January 16, 2022. Reprinted with permission from Baum et al.*[8] *C4 (Critical Care Coordination Center) is the name of Minnesota's Medical Operations Coordination Center.*

and 42.9% administrators (Table 3, e-Tables 2, 3). Respondents described instances of substandard care, bedside rationing, and moral distress. Most survey respondents supported triaging patients into ICU based on likelihood to benefit and addressing nonbeneficial ICU care (e-Table 2). After analyzing the 5 evidence sources, the CCWG and EWG consensus was that Minnesota was experiencing crisis conditions in November 2021.

CCWG and EWG Actions and Leadership Engagements in Response to Contingency and Crisis Conditions

The CCWG and EWG provided data to health care and public health leadership. In September 2021, CCWG offered support to CEOs of hospitals unaffiliated with major health care systems noting limited ICU capacity and increasing unmet MOCC transfer requests. They also met with a subset of large health care system CEOs to discuss providing intensivist support for unaffiliated hospitals as when the state peacetime emergency was in effect (fall 2020).[1,22] In October, CCWG and EWG leaders met with the SAT of the MDH to discuss current data and present the revised allocation framework. The SAT acknowledged CCWG's concern of crisis conditions and communicated the information to the commissioner of health. In early December, CCWG representatives met with large health care system CEOs, the Minnesota Hospital Association president, and the MDH Commissioner of Health to discuss crisis conditions and responses.

The CCWG and EWG suggested three options to increase tertiary care access for critically ill patients in nontertiary care hospitals.[1] The first was rotating ICU admission responsibility among the large health systems, similar to fall 2020[1]; the second was tertiary care systems temporarily affiliating with nontertiary care hospitals to support them with telemedicine or facilitating transfers; and third was large health systems staffing the MOCC with intensivists to provide phone support and prioritize transfers.[1,8] The CCWG and EWG also recommended health care organizations ethically allocate ICU resources with a coordinated approach using clinical judgment, the revised allocation framework, or both (e-Table 1). The CCWG and EWG endorsed implementing expedited dispute resolution policies for conflicts involving treatment believed to be nonbeneficial, potentially inappropriate, or futile, as published in MDH guidance.[24,31]

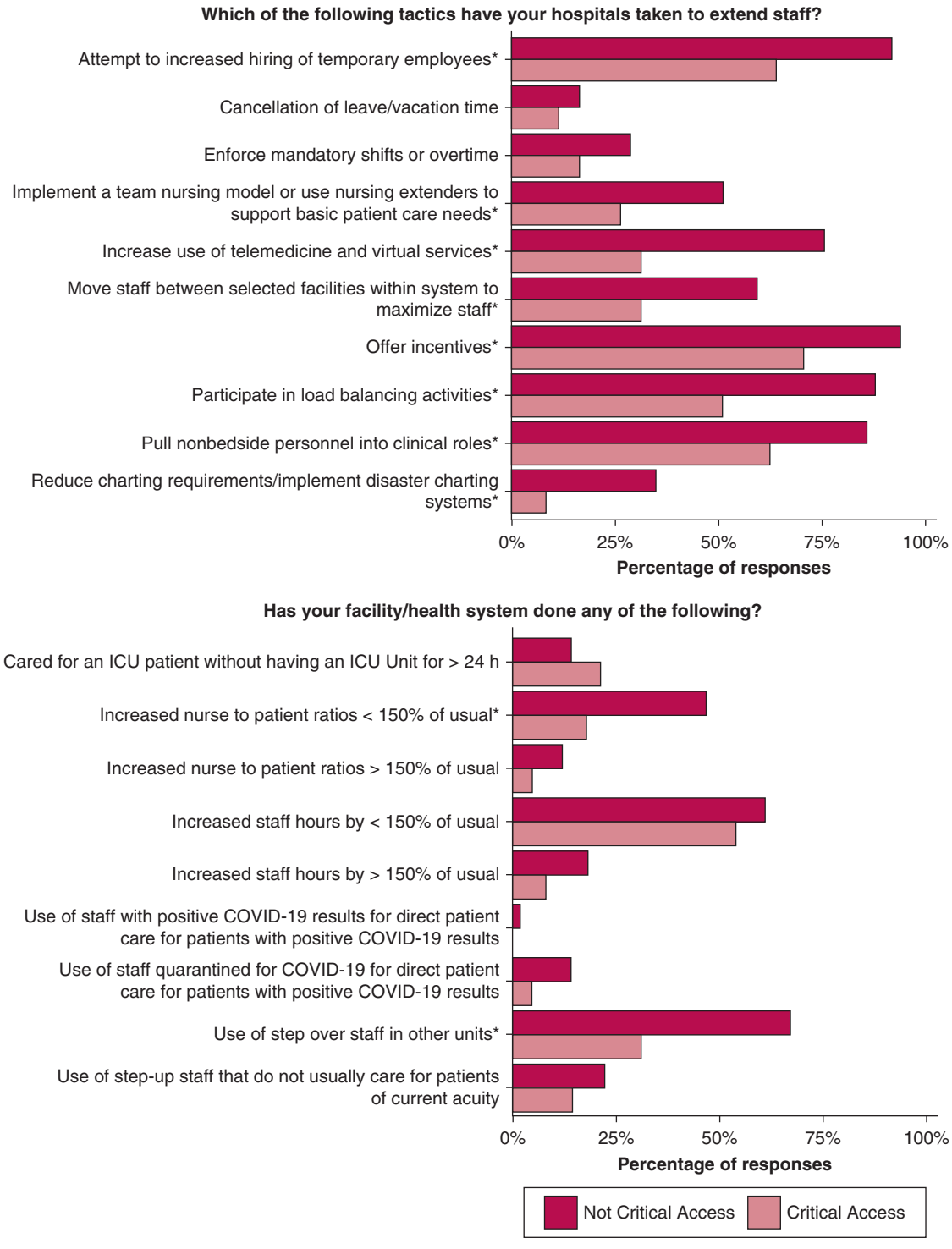

Figure 4 – *A, B, Bar graphs showing tactics to extend staff (A) and other actions to impact staff availability (B) from the Crisis Continuum Survey. Implementation is summarized for 61 critical access and 49 noncritical access hospitals (2 hospitals did not indicate critical access status). Frequencies of implementation were compared using 2-sample tests for equality of proportions; significant differences between critical access and noncritical access hospitals (P < .05) are indicated with an asterisk (*) after the tactic or action's name. Note the definition of step-over staff are staff with consistent training from other units caring for ICU-level patients (eg, post anesthesia care unit registered nurses to ICU), whereas the definition of step-up staff is those who do not care for patients of current acuity (eg, intermediate or teleregistered nurses to ICU).*[29] *Data courtesy of the Minnesota Department of Health.*

TABLE 2] MDH Crisis Continuum Survey Results

Survey Question	Overall (N = 112)	Not Critical Access (n = 49)	Critical Access (n = 61)	Difference in Proportions	95% CI	*P* Value[a]
What percentage of shifts have not been filled in the last 14 d?						.5
< 10%	46 (43%)	17 (36%)	29 (50%)			
10%-15%	36 (34%)	19 (40%)	16 (28%)			
16%-24%	16 (15%)	7 (15%)	8 (14%)			
> 25%	9 (8.4%)	4 (8.5%)	5 (8.6%)			
Unknown	5	2	3			
What percentage of patient care positions are currently open/not filled?						.029
< 10%	38 (35%)	10 (21%)	28 (47%)			
10%-15%	45 (42%)	25 (53%)	19 (32%)			
16%-24%	19 (18%)	8 (17%)	10 (17%)			
> 25%	6 (5.6%)	4 (8.5%)	2 (3.4%)			
Unknown	4	2	2			
Which of the following tactics have your hospitals taken to extend staff?						
Attempt to increased hiring of temporary employees	86 (77%)	45 (92%)	39 (64%)	28%	12% to 44%	.001
Cancellation of leave/vacation time	15 (13%)	8 (16%)	7 (11%)	4.9%	−10% to 20%	.6
Enforce mandatory shifts or overtime	25 (22%)	14 (29%)	10 (16%)	12%	−5.4% to 30%	.2
Implement a team nursing model or use nursing extenders	41 (37%)	25 (51%)	16 (26%)	25%	5.1%-44%	.013
Increase use of telemedicine and virtual services	56 (50%)	37 (76%)	19 (31%)	44%	26%-63%	< .001
Move staff between selected facilities within system to maximize staff	50 (45%)	29 (59%)	19 (31%)	28%	8.2%-48%	.006
Offer incentives	91 (81%)	46 (94%)	43 (70%)	23%	8.3%-38%	.004
Participate in load balancing activities	75 (67%)	43 (88%)	31 (51%)	37%	20%-54%	< .001
Pull nonbedside personnel into clinical roles	81 (72%)	42 (86%)	38 (62%)	23%	6.0%-41%	.012
Reduce charting requirements/ implement disaster charting systems	23 (21%)	17 (35%)	5 (8.2%)	26%	9.7%-43%	.001
Has your facility/health system done any of the following?						
Cared for an ICU patient without having an ICU unit for > 24 h	20 (18%)	7 (14%)	13 (21%)	−7.0%	−23% to 9.0%	.5
Increased staff hours by < 150% of usual	64 (57%)	30 (61%)	33 (54%)	7.1%	−13% to 27%	.6
Increased staff hours by > 150% of usual	14 (12%)	9 (18%)	5 (8.2%)	10%	−4.5% to 25%	.2
Increased nurse to patient ratios by < 150% of usual	36 (32%)	23 (47%)	11 (18%)	29%	10%-48%	.002

(Continued)

TABLE 2] *(Continued)*

Survey Question	Overall (N = 112)	Not Critical Access (n = 49)	Critical Access (n = 61)	Difference in Proportions	95% CI	*P* Value[a]
Increase nurse to patient ratios by > 150% of usual	9 (8.0%)	6 (12%)	3 (4.9%)	7.3%	−5.2% to 20%	.3
Use of staff with positive COVID-19 results for direct patient care for patients with positive COVID-19 results	1 (0.9%)	1 (2.0%)	0 (0%)	2.0%	−3.8% to 7.8%	> .9
Use of staff quarantined for COVID-19 for direct patient care for patients with positive COVID-19 results	10 (8.9%)	7 (14%)	3 (4.9%)	9.4%	−3.7% to 22%	.2
Use of step-over staff in other units (eg, PACU RNs to ICU)	53 (47%)	33 (67%)	19 (31%)	36%	17%-56%	< .001
Use of step-up staff who do not usually care for patients of current acuity (eg, intermedial or tele-RNs to ICU)	20 (18%)	11 (22%)	9 (15%)	7.7%	−8.8% to 24%	.4
Which (nonemergent procedure) tiers are you considering pausing?						
Tier 1: Can delay safely only for up to 2 wk	8 (7.1%)	2 (4.1%)	4 (6.6%)	−2.5%	−13% to 7.7%	.9
Tier 2: Can delay safely for up to 1 mo	9 (8.0%)	7 (14%)	2 (3.3%)	11%	−1.6% to 24%	.081
Tier 3: Can delay safely for up to 90 d	26 (23%)	22 (45%)	4 (6.6%)	38%	21%-55%	< .001
Tier 4: Can delay safely for > 90 d	27 (24%)	22 (45%)	5 (8.2%)	37%	19%-54%	< .001
Has your facility activated a triage team or ethics group for allocation decisions of resources?	23 (21%)	16 (33%)	7 (11%)	21%	4.0%-38%	.013
What resource(s) is/are your facility currently allocating?						
Hospital admissions	17 (15%)	13 (27%)	4 (6.6%)	20%	4.3%-36%	.009
ICU beds/admissions	12 (11%)	10 (20%)	2 (3.3%)	17%	3.2%-31%	.011
Monoclonal antibody appointments	6 (5.4%)	2 (4.1%)	4 (6.6%)	−2.5%	−13% to 7.7%	.9
Ventilators	3 (2.7%)	1 (2.0%)	2 (3.3%)	−1.2%	−8.4% to 6.0%	> .9
Over the past 14 d, has your average emergency department wait time been > 4 h?	10 (8.9%)	8 (16%)	1 (1.6%)	15%	2.0%-27%	.015

Data are presented as No. (%) unless otherwise indicated. The MDH Crisis Continuum Survey was completed by 112 of 128 Minnesota hospitals (87.5%) between September 24, 2021, and October 7, 2021, and was undertaken to assess whether contingency or crisis-level conditions were present (comparisons made between noncritical access and critical access hospitals; 2 hospitals did not indicate critical access status and are excluded from comparisons).[28] Non-critical access hospitals hereafter are referred to as larger hospitals. CCWG and MDH leaders were most concerned regarding the potential disproportionate impact of the COVID-19 pandemic on less resourced critical access hospitals, which formed the basis for this comparison. Survey results raw data were presented to the SAT in October 2021, with statistical analysis later completed in preparation of this article. At least 16% of staffing shifts were unfilled in the prior 14 d for 23.4% of organizations overall, and at least 16% of patient care positions were unfilled at 23.6% of organizations overall. Data supporting contingency-level conditions included both groups of hospitals using tactics to extend staffing, but larger hospitals to a greater degree; and both using critical staffing strategies, although again, larger hospitals to a greater degree. Although critical access hospitals delayed nonemergency surgeries and procedures < 10% of the time across all 4 tiers, 45% of larger hospitals were delaying tier 3 and 4 cases. Data supporting potential crisis care conditions included triage teams or ethics groups being activated for allocation decisions in both larger and critical access hospitals (33% vs 11%), and specifically for allocating hospital admissions (27% vs 6.6%) and ICU beds or admissions (20% vs 3.3%); both larger and critical access hospitals reported caring for patients awaiting an ICU bed for > 24 h (14% vs 21%). Note the definition of step-over staff is staff with consistent training from other units caring for ICU-level patients (eg, post anesthesia care unit RNs to ICU), whereas the definition of step-up staff is those who do not care for patients of current acuity (eg, intermediate or tele-RNs to ICU).[29] CCWG = Critical Care Working Group; MDH = Minnesota Department of Health; RN = registered nurse; SAT = Scientific Advisory Team.

[a]χ^2 test of independence and 2-sample test for equality of proportions.

TABLE 3] Crisis Conditions Survey, Individual Responses to Open-Ended Crisis Conditions Questions 6-9 (Representative Quotations From Full e-Table 3), November 16-23, 2021

Question 6: List specific deidentified instances of substandard care related to lack of ICU beds you have encountered in the last week.
As a triage officer at a large hospital: • "A septic elderly patient with biliary obstruction was initially admitted at a CAH. Hypotensive but fluid resuscitation initially helped, but no medical beds were available for transfer. Kept at CAH, but no source control achieved so became hypotensive 3 days after admission requiring pressors, yet again no beds available at tertiary care center ICU (where an ERCP could be done). Patient eventually made it to ICU, but on several pressors and in renal failure. ERCP done and duct cleared, but patient remained on dialysis and critically ill for several days." • "Young patient in septic shock, diabetic ketoacidosis, portal venous thrombosis, and likely ischemic gut presented to CAH, treated in the ED with central line and pressors, insulin infusion, etc. 16 hours' wait in the ED with the patient unable to get to a higher level of care where exploratory laparotomy may have saved this patient's life. Expired in the outside ED." • "I have had 1 COVID[-19] death this week. Patient was here 9 days and we called all over daily for placement including the critical care coordination center line and could not get them transferred so they subsequently coded and died." • "I also have a middle-aged patient with a small bowel obstruction (stage 4 liver disease) that has been here 14 days. No available transfer, no accepting surgeon. Our hospital does not typically use central lines, but a locum surgeon put 1 in so we could give them hyperalimentation (another service not provided here). To top that we only have 4 more days of lipids for this patient as they are on back order." • "Giving massive pulmonary embolism patient tissue-type plasminogen activator in rural ED without hopes of finding an ICU bed (have dealt with this at least 7 times in past month), several patients paralyzed, proned, on mechanical ventilation at rural hospitals (COVID[-19]). Treating diabetic ketoacidosis in rural EDs." • "I've had difficulty finding inpatient beds for patients who need emergent surgery without an ICU need that end up with prolonged ED stays." • "COVID[-19] patient on prolonged mechanical ventilation related to staff inexperience with ventilator management, critical care (eg, sedation, proning, weaning). I suspect would have been extubated sooner under critical care management." • "Patient with gastrointestinal diagnosis requiring transfer to interventional radiology for diagnostic procedure, but no bed available; many more examples if we extend this window beyond 1 week." • "Older patient presented with hemoptysis and no bed was available. They were discharged AMA to private vehicle to find another hospital which could treat them." • "Middle-aged patient presented with COVID[-19]. They rapidly declined maxing out high-flow nasal cannula and BiPAP and required intubation in our CAH. They were in the ED for greater than 30 hours." • Middle-aged patient w[ith] no past medical history presented with non-ST[-segment] elevation myocardial infarction, but with very concerning history and physical [examination findings]. No beds available. Eventually found a bed in 7 hours away. They ended up with open heart surgery." • "On several instances in the last week, we have had ICU-level care patients in our Stepdown Care Unit. Our nurses do not have the training, experience, resources, or equipment to care for ICU patients. We have maintained patients on BiPAP longer than clinically indicated because our staff is not as familiar with ventilator care."
Question 7: List specific instances when bedside providers have been forced to ration resources at the bedside within the last week.
• "Nursing staff is our critical resource, and it is being rationed without any discussion or conversation. Other departments are also critically understaffed in our critical access hospital: respiratory therapy, emergency department providers and nursing, inpatient nursing. I saw my patient in the special care area (ICU at our CAH), and the rationing of the care at the bedside was all unspoken: why the patient wasn't going to see the patient's cardiologist, or cardiothoracic surgeon, or nephrologist, much less a transplant nephrologist. The patient was just going to see me and my overworked colleagues doing our best to provide the care needed, recognizing that we couldn't transfer the patient to the tertiary center to receive the care that would have been better/best. I talked about the inability to transfer to a higher level of care, but I don't think the patient appreciated the implications." • "I had 2 patients this week that I asked to change their code status to Do Not Resuscitate as the BiPAP was in use and we only have 1." • "Patient who needed intravenous antibiotics was discharged home because there were no beds; and the ED was just too full to keep them." • "Patients with less urgent complaints have to wait as our staff are busy caring for critical patients that should have been transferred. We have patients with complaints like lacerations walk out of our waiting room because they don't want to continue to wait to be seen." • "Holding patents in the ED due to lack of telemetry beds. Triaging who gets the telemetry bed." • "Only 1 ventilator; we cannot keep vented patients. Floor nurses do not know how to care for these patients." • "Spreading thinner the ICU nurse-patient index to include non-ICU staff to support patient care needs."

(Continued)

TABLE 3] *(Continued)*

Question 8: List specific, deidentified instances of moral distress related to Questions 6 and 7.
• "So here is my personal moral distress (I assume this is de-identified): As a hospitalist, I regularly triage patients from around the region into our hospital. By the same token, I round and cross-cover our COVID[-19] and non-COVID[-19] ICU patients. Last week, day after day, I took care of multiple patients who had a very poor prognosis, but aggressive cares were still being pursued by families, some even against the advice of our physicians. Out of curiosity, I ran our tertiary triage/ventilator allocation schema on 4 patients, and they all scored as if they would likely be terminally triaged if we were in crisis standards of care. Over the last weeks in my triage officer role, I was unable to accept patients with acute stroke for advanced therapies (which may prevent a lifetime of disability), a young renal failure patient with hyperkalemia only needing dialysis, an intubated COVID[-19] patient with no comorbidities, and a postoperative wound infection with sepsis, among others. The moral distress that I and many others are experiencing is created by actually seeing the futility of care on one hand and—on the other [hand]—the inability to help those who could actually benefit from lifesaving medical care. Additionally, for those of us involved in the triage of patients, the question of whether we are making judgment calls devoid of bias and in the best interest of all of the patients waiting for a bed continues to haunt us."
• "So much moral distress. Nightly calls with access center to triage waitlist for ICU beds, having 4-6 patients waiting with no bed available. Currently young patient at nonmetro hospital, prone, sedated, paralyzed, on vent with no bed available at any metro site, while also having 5 others on our waitlist who are critically ill. Not having a bed for a young patient with hemoglobin 5.5 in hemorrhagic shock due to gastrointestinal bleed."
• "I appreciate this question. I have never felt more traumatized working in medicine before these last 3 weeks. I walk into work, and I can feel the pain everyone is experiencing. This weekend, I screamed at my spouse for sneezing (without covering it) saying, 'If you get us sick, there is no bed for us! There is no help.' I have been sleeping more than normal because I am so emotionally exhausted. I love my job, and I love working in rural emergency medicine, but the emotional distress from this has been horrible. However, I don't feel moral distress because I have done everything I can to help my patients. The inability to help people has been heartbreaking."
• "Due to lack of BiPAP resources and ventilators, my respiratory supervisor feels like she has been in a situation where they have placed their last resource on a patient that 'should have been hospice' only to have a 20-year-old walk in the door who needed that very same resource 20 minutes later."
• "Anxiety about my shifts. Worried we're going to have a death from preventable cause."
• "Multiple ED nurses quitting, physicians starting to quit. Hospital system leaders who offer no solutions, just 'thanks for your service' platitudes."
• "Being unable to place all patients in the critical care coordination center queue has caused considerable moral distress, as acuity is higher than ever."
Question 9: Please elaborate on any other issues related to scarcity you have encountered in the last week.
• "Patient with a balloon pump arrived and there was no ICU balloon pump-trained nurse to care for the patient."
• "Inability to push families of patients with poor prognosis to shift toward comfort care despite clearly futile care."
• "Ten staffed critical care beds available in all of Minnesota available last Friday—why isn't this the front page story in the *Star Tribune* and everywhere else? Why isn't the hospital association having a 'come to Jesus' moment about business as usual and how we need major reform to health care to survive and thrive, both now and into the future? The failed model of health care in the USA should be apparent, yet we persist with business as usual—overpaid outpatient elective surgical care backfills the mental health and acute/chronic disease care that has been historically underfunded and neglected, to the point that there seems no way out without major system reform/overhaul."
• "The public is unaware of these challenges, which is maddening."
• "Only 2 sets of tubing left for the BiPAP machine, on back order now."
• "We expanded our COVID[-19] beds as much as we can, but there are so many more that we can't keep here as there are no beds left. They get sent home, some with oxygen some not. Some return and some just die at home. I feel like we are living in a third-world country."
• "Boarding patients over 24 hours in ED no ICU beds; increase in against medical advice/left without being seen patients in ED due to full ED due to no beds to transfer patients to."
• "Emergency medical services travelling so far to take p[atien]ts to beds that their own communities are short of emergency medical services."
• "Larger health care systems within Minnesota are openly or quietly not accepting transfers from patients outside of their systems."
• "7:1 nursing ratios in the ED (supposed to be 1 to 3:1)"

Survey methodology is discussed in Methods. These are selected, representative quotations chosen from a larger database of individual experiences and perceptions shared in survey responses (e-Table 3). To protect the anonymity of both respondents and individually referenced patients, some of the information initially provided has been redacted. The total numbers of responses received per question were as follows: question 6, 23 responses; question 7, 12 responses; question 8, 21 responses; and question 9, 17 responses. AMA = against medical advice; BiPAP = bilevel positive airway pressure; CAH = critical access hospital; ED = emergency department; ERCP = endoscopic retrograde cholangiopancreatography.

TABLE 4] Pandemic Severe Surge Best Practice for Prioritization During the COVID-19 Pandemic, Developed by CCWG Members (December 2021)[1]

Severe Surge Best Practice	Date Established	Detailed Description of Severe Surge Best Practice
Prioritization: clinical pandemic severe surge best practice for triage of critically ill patients admitted through emergency departments and inpatient care areas, and acknowledgment that no reallocation of resources is available after patients are admitted	December 2021 (fall 2021 surge)	• During periods of severe pandemic surge resulting in demand for clinical resources exceeding supply, all health systems are empowered to develop standard consistent care processes for prioritization of patients in emergency departments, ICUs, medical/surgical departments, and all other inpatient care areas based on clinical assessment, with priority given to those patients deemed most likely to benefit from this care. This prioritization should be provided by experienced clinicians engaged in patient care, but may include consultation with other experienced colleagues or those with ethical familiarity in circumstances where patients vying for this scarce resource are believed to be clinically equivalent. Prioritization may use the current MDH-accepted scoring system, but it is not required to do so given its acknowledged limitations. • Decisions to prioritize because of resource scarcity must not be confused nor conflated with decisions that an intervention is determined to be futile, potentially inappropriate, or nonbeneficial for patient for specific reasons not related to scarcity. • This Minnesota Critical Care Working Group severe surge best practice is intended to be complementary to MDH guidance: Ethical Framework for Contingency & Crisis Care (https://www.health.state.mn.us/communities/ep/surge/crisis/framework_transitions.pdf)

The process for developing the pandemic severe surge best practice is discussed in Methods. CCWG = Critical Care Working Group; MDH = Minnesota Department of Health.

Health Care System Actions in Response to Crisis Conditions

Health care systems used strategies to address crisis conditions including delaying nonemergent procedures and supporting public messaging describing the dire circumstances facing Minnesota health care systems, a campaign receiving local and national attention.[32] Intensivist support to the MOCC and support for nontertiary care-affiliated hospitals was supported in principle, although without further actions or resources committed. Despite collaborative efforts in developing ethical and operational recommendations, little support was available for statewide implementation of standard processes for resource allocation or implementation of expedited review for dispute resolution regarding futile, nonbeneficial, or potentially inappropriate treatment without state government authorization.

ICU admissions and transfers were prioritized by bedside intensivists and triage officers and teams. Critically ill patients not transferred to tertiary care centers were managed in place by nonintensivists or telemedicine support often in nontertiary care hospitals. The MOCC efforts to transfer patients met with decreased success, defaulting to a first-come, first-served methodology. The CCWG developed a severe surge best practice supporting organizations' prioritization efforts as being consistent with best care under pandemic crisis conditions (Table 4). The fall surge receded in December 2021 and resolved by March 2022, with each organization transitioning independently back to conventional care models.[1]

The hotwash sessions identified CCWG strengths, including establishment of communication networks among large health care systems, a collaborative and creative environment, ethics involvement, cross-connections with other state actors, and collaboration with the regional health care preparedness coordinators. Issues limiting the group's effectiveness were classified into 3 themes: a lack of a singular process for determining crisis standards of care, inability to impact the actions of either the public or health care organizations, and a lack of clear scope or vision for the group's work.

Discussion

National pandemic planning since 2008 assumed a set of actions leading to crisis conditions and formal CSC government declaration.[33] They included triage team formation, development of allocation frameworks, indicators for identifying crisis conditions and triggering CSCs, and a predictable implementation process with state governments providing regulatory and legal protections.[6,7,33-35]

The COVID-19 pandemic was less predictable, with conditions frequently transitioning between contingency

and crisis, resulting in heterogeneity in how hospitals and states approached crisis conditions, resource allocation, and triage.[36,37] Only 9 US states and one Texas county formally declared CSCs and 12 states provided political and legal support for allocation of scarce critical care resources.[37] In Canada, provincial triage protocols were not used even during periods of severe surge.[38] No peer reviewed publications have provided data on implementation of scarce resource allocation, with most experiences being anecdotal.[37,39]

An important barrier to declaring crisis conditions was the lack of evidence-based indicators correlating with outcomes including mortality, and instead were focused on resource supply, including ICU beds or ventilators.[7,26,35] In Minnesota, bed availability was helpful in identifying surge onset, but less so after ICU beds were occupied (Fig 1).[1,25,26] The 5 sources of evidence the CCWG used for identifying crisis conditions (Table 1) proved more valuable, starting with professional consensus and teletracking data.[25,26] The MOCC data showing decreased patient placement success was a more dynamic measurement of strain than ICU bed availability.[8] The MDH crisis continuum survey showed health care system responses to impending crisis conditions, with larger hospitals under pronounced strain with greater implementation of staffing tactics and deferring of nonemergent procedures. Similar to fall 2020, insufficient health care staff was the most limiting resource.[1,27] The Metro Crisis Conditions survey demonstrated moral distress experienced by Minnesota health care workers and suggested inequitable distribution of resources and increased mortality. We are unaware of similar published surveys administered during severe surge to assess crisis conditions at state or regional levels.

As soon as crisis conditions existed, some Minnesota health care systems used triage officers or teams not engaged in clinical care for prioritizing admissions or transfers to the ICU, allowing bedside clinicians to focus on clinical care.[13,36,40] Neither the 2021 version of the clinical allocation framework nor the guidance on dispute resolution were implemented, similar to other experiences.[36,39] No specific government authorizations were available or were extended to hospitals or providers to support allocation decisions.[11,41] The uncertainties regarding CSCs among health system leaders and clinicians undermined their implementation.

One Minnesota health care system used existing institutional dispute resolution policy to move toward withdrawal of ventilator support from a patient with COVID-19 over the objection of a surrogate decision-maker. However, the surrogate's request for a temporary restraining order to prevent withdrawal was granted by a court pending additional hearings, illustrating the difficulties of withdrawing interventions without additional authorities and protections. The patient eventually was transferred to another state and died shortly thereafter. The surrogate's lawsuit was dismissed.[42]

It is unknown whether statewide mortality would have decreased if resource allocation had been implemented. Little published evidence is available showing that available clinical allocation frameworks would have resulted in equitable and accurate decisions.[20,43,44] However, the absence of a coordinated resource allocation process was ethically and morally disturbing to CCWG and EWG members.[24,39] This unaccountable and procedurally opaque manner of implicit rationing raised serious concern that the burdens of scarcity were distributed unevenly in Minnesota.

Patients not chosen to receive ICU care continued to receive life-sustaining interventions in non-ICU settings, in contrast to assumptions before the pandemic of an intentional plan to provide non-ICU or palliative care measures, or both.[33] The crisis conditions survey responses suggested that their care often was downgraded because of insufficient resources (Table 3, e-Table 3). The CCWG members' concern remained that rural hospitals were severely impacted, supported by MOCC data demonstrating greater numbers of nontertiary care hospital transfer requests, MDH survey data signifying less tertiary care capacity because of strain, and CCWG fall 2021 shared experience.[8,45]

The moral distress experienced by the Minnesota health care workforce was severe (Table 3, e-Table 3). Health care professionals reported substandard care because of scarce resources, implicit rationing, and insufficient staff and equipment. In one professional's words, "How am I gonna convince yet another patient/family that they should change their code status because we do not have the equipment to maintain them?" These experiences are consistent with CCWG and EWG members' professional experience and reports from others.[36,39,40] The CCWG established the severe surge best practice to support clinicians prioritizing care during crisis conditions (Table 4).

The authors recommend research to define crisis condition indicators, including resource demand and

TABLE 5] CCWG and EWG Recommendations for Severe Surge Crisis Conditions Indicators for Research and Planning Priorities, MOCC Functions, and Resource Allocation and Crisis Condition Processes and Preparation

Proposed crisis conditions indicators[a]

- Demand indicators
  - ED patients awaiting ICU admission: No. of patients, average duration queuing time, rate of accelerating change in numbers of patients
  - MOCC patient placement (No./percent), request-placement difference
- Response indicators:
  - The No./types of staffing tactics/actions in response to surge, postponement of nonemergent procedures
- Less helpful: resource supply indicators
  - The No. (percent) of available ICU beds, the No. of available pieces of equipment (eg, ventilators, dialysis machines; availability of supplies)

Proposed MOCC functions[b]

- Load balancing
- Quantitative and qualitative data collection
- Multistate MOCC coordination
- Intensivist telemedicine support and patient prioritization

Proposed resource allocation and crisis condition processes and preparation[c]

- Ensure presence of clinical, legislative, and legal support for implementing CSCs before crisis conditions event
- Identify patients with extremely poor prognoses before ICU admission and after prolonged ICU care

CCWG = Critical Care Working Group; CSC = crisis standard of care; ED = emergency department; EWG = Ethics Working Group; MOCC = Medical Operations Coordination Center.

[a]CCWG and EWG consensus is that indicators based on resource demand and health care system response to surge are more helpful than indicators based on resource supply. Emergency department data, patients identified for ICU admission (resource demand) in particular may serve as an early warning of crisis conditions.[45,46] CCWG recommends research on the health care system response indicators, including staffing adjustments and postponement of nonemergent procedures, with future research to identify specific key factors.[45] Resource supply indicators such as the availability of ICU beds and equipment, supplies, or both used to support organ dysfunction can help state, regional, and individual health care systems prepare for crises, but are not as useful in identifying crisis conditions nor in tracking them once they occur.[1,36]

[b]MOCCs were helpful in load balancing during the pandemic.[1,8,47,48] Significant changes in the volume of placement requests and placement outcomes can identify health care system strain and the onset of crisis conditions.[8] MOCCs should be supported to load balance, coordinate resource sharing, and gather data on resource availability and demand. MOCCs should work within multistate regions when events overwhelm individual states' resources. Physicians at MOCCs can prioritize patients awaiting ICU admission and support providers caring for patients in non-ICU settings when patients are awaiting transfer.

[c]Most important is recognizing when crisis conditions are present based on the clinical indicators, implementing clinical, legislative, and legal structures in place to acknowledge and support CSC actions, and finally being able to identify accurately patients with extremely poor prognoses before ICU admission and after prolonged ICU care.

resource response.[1] Resource supply indicators, such as ICU beds or ventilators, remain helpful, but inadequately reflected severe surge dynamics after resources were in use (Table 5).[1,8,26,36,45-48] Proposed crisis condition demand indicators include the number of critically ill patients awaiting ICU admission in EDs, wait time durations, and the accelerating rate of numbers of patients.[8,46,49] The CCWG organizations observed ED overcrowding during severe surge conditions, described by others.[47,49] Proposed crisis condition response indicators include use of staffing tactics and postponement of nonemergent procedures, documented by CCWG experience and the MDH survey data (Table 2, Fig 4), consistent with others' recommendations.[1,46] Postponement of nonemergent procedures from federal teletracking data demonstrated an inverse relationship between non-COVID-19 and COVID-19 hospitalizations and ICU bed occupancy during the fall 2020 and 2021 surges (Figs 1, 2), although higher COVID-19 ICU acuity may have contributed.[1,25,26] Transferability of these strategies is limited because health care environments must respond using regionally available resources.[1]

MOCC load balancing was valuable when resources were available. MOCC data helped to reveal the magnitude of unmet demand and is a proposed crisis condition indicator.[8] Statewide MOCCs may support rural hospitals in accessing tertiary care centers and may collaborate with each other in large disasters to load balance care.[8,45,50,51]

ICU strain during a severe surge led to prioritizing patients for ICU admission, as under conventional circumstances.[52] ICU strain is a proposed research objective with focus on populations most harmed by delay and providing optimal care to those waiting and is being incorporated into critical care practice and training.[52-54]

Mortality was increased and resources distributed inequitably during COVID-19 pandemic crisis conditions.[49,47,55–57] Political, cultural, and economic factors likely will present barriers to ethical resource allocation during future crises in the United States.[58–60] Nonetheless, the CCWG and EWG recommend research on identifying populations with poor prognosis before ICU admission and those failing to benefit after prolonged ICU care.[33,36,61] Equitable resource allocation potentially can increase health care capacity, can improve equity, and can reduce moral distress.[23,36,48]

Statewide working groups such as the CCWG are valuable in planning and coordinating responses. The CCWG recommendations include having a clear position within the response, a well-defined scope of work and authority, and direct engagement with high-level leadership.[62] Statewide groups should include multiple specialties, or similar clinical working groups should be established.

No Minnesota statute exists for determining a specific public health emergency, and even the peacetime emergency implemented by the governor's executive order for COVID-19 required renewal every 30 days with legislative agreement.[10,22] Future legislation should define parameters for declaring a public health emergency, including crisis conditions of care and the authorities contained, and should empower governmental and health care coordination and information sharing to promote trust and good faith (Jan Malcolm, Commissioner, Minnesota Department of Health, 2019-2023, personal communication, October 2, 2024).

The limitations of this article include the lack of clinical and outcomes data. It also represents only 1 working group and state's perspective with limited transferability, given the diverse nature of the American health care system.

Finally, the highest priority in any disaster is preventing unnecessary deaths and ensuring equitable access to lifesaving resources during periods of severe ICU strain, as during the COVID-19 pandemic.[52] Continued work is needed to create effective strategies to monitor strain and to anticipate and identify crisis conditions, to coordinate resources among health care systems, to supply resources efficiently and equitably, and to provide quality services during any level of surge wherever a patient seeks care.[36,62,63]

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