Crisis Standards of Care – Pediatrics
A Guidance Document for the State of Nebraska

This guidance is adapted from the Western Regional Alliance for Pediatric Emergency Management (WRAP-EM) Pediatrics Crisis Standards of Care template and the Children's Hospital and Medical Center of Omaha's COVID-19 Pandemic Triage and Crisis Standards of Care Plan.

Introduction

In the state of Nebraska, 24.6% of the population is under the age of 18 and considered to be a part of the pediatric population. However, the number of licensed pediatric ICU beds in the state is not proportional to that number. In the event of a medical surge event affecting pediatric populations, the number of pediatric beds would likely be overwhelmed. Due to the unique needs of children, a specialized crisis standards of care plan needs to be implemented to ensure that the standards used for adult patients are not universally applied to children. This document will serve as an appendix to the "Crisis Standards of Care Planning Guidance for the COVID-19 Pandemic in the State of Nebraska" document.

Definitions:

Crisis standards of care (CSC) refer to substantial changes in usual health careoperations due to a pervasive or catastrophic disaster that necessitate rational utilization of scarce resources like space, personnel, and equipment to provide the best possible delivery of health care to the greatest number of patients.

Triggers:

CSC may arise within regional or specific hospital or other health care settings based often on formally-declared emergencies or corresponding executive orders that change the legal and ethical landscapes to facilitate shifts in prevailing health care delivery.

Ethical Considerations:

Standards of care should adhere to core ethical principles, including fairness, duty to care, duty to steward resources, transparency in decision-making, consistency, proportionality, and accountability. When resource scarcity reaches crisis levels, providers are ethically justified to use available resources to sustain life and well-being to the greatest extent possible for the greatest number possible.

Practical Considerations:

CSC should be considered only in circumstances when healthcare demands exceed capabilities (e.g., beds, equipment, or staffing) of a community or institution after all contingency level efforts have been implemented. These efforts may include expansion of facility capabilities beyond standard operations, lawful and permissive transfers of patients, supplementation of capabilities with alternative resources and alternative care sites, and flexing of standard legal guidelines. Implementation of CSC guidance routinely is within the scope and authority of a governmental agency or a healthcare facility incident command system. Engagement of subject matter experts, healthcare providers, or EMS personnel in the implementation process is appropriate and

encouraged. Different CSC plans may coexist at multiple different levels (state, local or healthcare facility)and in different neighboring states, appropriately recognizing the variable resource constraints and specific procedures in each setting. Still, conceptual alignment of definitions, scope, triggers, and algorithms to the greatest extent possible is ideal, particularly in the context of resource-constrained tertiary pediatric capabilities.

Pediatric Specific Guidance:

CSC implementation should focus on optimizing the best possible healthcare delivery to the most patients by prioritizing resources as follows:

- Delivery of care in lower level settings and with minimal resources wherever possible (examples include keeping patients in ward settings rather than transferred to intensive care units, utilization of alternative oxygen support rather than ventilators, intentional delays in procedures, minimal necessary pharmaceuticals, or expanded nursing ratio care settings).
- Resource intensive care support and operative interventions to patients with appropriate consideration for anticipated short or long-term needs,and anticipated probability for long term recovery.

Practical implementation of these goals can be assisted with predetermined guidelines for care delivery. Notwithstanding concerns over the potential for unintended disparate impacts of scoring systems among vulnerable populations, several models have been developed to implement CSC decisions in real-time. Many of these have not been validated well for children, but may be in place institutionally for adult patients, such as the SOFA score. The most reliable of pediatric scores to assist with this process is the PELOD-2.

Allocation Criteria for ICU admission/ventilation:

Consistent with accepted standards during public health emergencies, the primary goal of the allocation framework is to maximize benefit to populations of patients, often expressed as "doing the greatest good for the greatest number". First responders and bedside clinicians should perform the immediate stabilization of any patient in need of critical care, as they would under normal circumstances. Along with stabilization, temporary ventilatory support may be offered to allow the triage officer to assess the patient for critical resource allocation. Every effort should be made to complete the initial triage assessment within 90 minutes of the recognition of the need for critical care resources.

Step 1: Calculation of each patient's priority score using the multi-principle allocation framework
This allocation framework is based on two primary considerations: 1) saving the most lives; and 2) saving the most life-years. Patients more likely to survive with intensive care are prioritized over patients less likely to survive with intensive care. Patients without serious comorbid illness are given priority over those with illnesses that limit their life expectancy. Life-limiting comorbid conditions are used to characterize patients' longer-term prognosis.

The Critical Care Triage Team will use the PELOD-2 score system[3,4] as the primary criteria to evaluate the status of patients in need of the resource in question. If PELOD-2 is indeterminate, other relevant comorbidities will be considered.

PEdiatric Logistic Organ Dysfunction-2 (PELOD-2) score is used to characterize patients' prognosis for

hospital survival (see Table 1). Points are assigned according to the patient's PELOD-2 score (range from 1 to 4 points); the presence of comorbid conditions (2 points for major life-limiting comorbidities, 4 points for severely life-limiting comorbidities (Table 2)). These points are then added together to produce a **total priority score**, ranging 1 – 8. **Lower scores indicate higher likelihood to benefit from critical care; priority is given to those with lower scores.**

Table 1. Multi-principle Strategy to Allocate Critical Care/Ventilators During a Public Health Emergency

Principle	**Specification**	**Point System** lowest cumulative score = highest priority			
		1	**2**	**3**	**4**
Save the most lives	PEdiatric Logistic Organ Dysfunction-2 (PELOD-2)	PELOD-2 < 10	PELOD-2 = 10-15	PELOD-2 = 16-23	PELOD-2 > 23
Save the most life-years	Long-term survival prognosis (including comorbid conditions)	…	Major comorbid conditions with substantial impact on long-term survival	Major comorbid conditions with substantial impact on long-term survival + 3 or more medical technologies	Severely life-limiting conditions; death likely within one year

Table 2. Examples of Major Comorbidities and Severely Life-Limiting Comorbidities

Examples of Major comorbidities associated with significantly decreased long-term survival)	**Examples of Severely Life Limiting Comorbidities (associated with survival < 1 year**
- Malignancy with a < 5 year expected survival - Modified Ross Class III heart failure - Moderately severe chronic lung disease (home biPaP or ventilator use) - End stage renal disease - Severe pulmonary hypertension refractory to medications - Single ventricle congenital heart disease - Severe immunodeficiency - Immunosuppression	- Metastatic cancer receiving only palliative treatments - Modified Ross Class IV heart failure - Severe chronic lung disease with FEV1 < 25% predicted, TLC < 60% predicted, or baseline PaO2 < 55mm Hg - Liver cirrhosis with PELD score ≥20

Step 2: Assign patients to color-coded priority groups

When a patient's priority score is calculated (see Table 2) each patient is assigned a color-coded triage priority group, which should be noted clearly on their chart.

CODE COLOR / PRIORITY LEVEL	MULTI-PRINICPLE PRIORITY SCORE (TABLE 1)
RED **highest priority**	**1 – 3**
ORANGE **intermediate priority** (reassess as needed)	**4 – 5**
YELLOW **lowest priority** (reassess as needed)	**6-8**
GREEN **do not manage w/scarce critical care resources** (reassess as needed)	**no significant organ failure, or** **no critical care resource requirements**

Other considerations:

1) Resolve "ties" in priority scores between patients by using life-cycle considerations as a tiebreaker, with priority going to younger patients. If still tied, a lottery (i.e., random allocation) should be used.
2) This allocation system makes clear that all individuals are "worth saving." All patients who would receive mechanical ventilation during routine clinical circumstances are eligible; only ventilator availability determines how many eligible patients receive it.
3) Clinicians overseeing conditions that lead to immediate or near-immediate death despite aggressive therapy (e.g., cardiac arrest unresponsive to appropriate ACLS/PALS, overwhelming traumatic injuries, massive intracranial bleeds, intractable shock) should stop providing critical care services.

Section 3. Reassessment for ongoing provision of critical care/ventilation

1) All patients who are allocated critical care services will be allowed a therapeutic trial of a duration to be determined by the clinical characteristics of the disease.
2) Decisions about trial duration will be made as early in the pandemic as possible, when data becomes available about the natural history of the disease. The trial duration should be modified as appropriate if subsequent data emerges which suggests the trial duration should be longer or shorter.
3) The Triage Team will conduct periodic patient reassessments re: critical care/ventilation, which involves re-calculating PELOD-2 scores and consulting with treating clinical teams about patients' clinical trajectory.
4) Patients showing improvement or stability will continue with critical care/ventilation until the next assessment. If stable but remaining at a Multi-Principle Priority Score 6-8, improvement should be observed within 7 days, otherwise stability will have the same standing as worsening.
5) If there are patients in the queue for critical care services, then patients who upon reassessment show substantial clinical deterioration as evidenced by worsening PELOD-2 scores or overall clinical judgment should not receive ongoing critical care/ventilation.
6) Although patients should generally be given the full duration of a trial, if patients experience a precipitous decline (e.g., refractory shock and DIC) or a highly morbid complication (e.g., massive stroke) which portends a very poor prognosis, the Triage Team may make a decision before the completion of the specified trial length that the patient is no longer eligible for critical care treatment.
7) Patients who are no longer eligible for critical care treatment will receive medical/comfort care including intensive symptom management and psychosocial support. The Palliative Care team is available for consultation.

Appendix

I. Detailed Scoring Systems
   A. PELOD-2
      i. Online Scoring Calculator
   B. SOFA

I. Detailed Scoring Systems

A. PELOD-2

Organ Dysfunctions and Variables[a]	Points by Severity Levels						
	0	1	2	3	4	5	6
Neurologic[b]							
Glasgow Coma Score	≥ 11	5–10			3–4		
Pupillary reaction	Both reactive					Both fixed	
Cardiovascular[c]							
Lactatemia (mmol/L)	< 5.0	5.0–10.9			≥ 11.0		
Mean arterial pressure (mm Hg)							
0 to < 1 mo	≥ 46		31–45	17–30			≤ 16
1–11 mo	≥ 55		39–54	25–38			≤ 24
12–23 mo	≥ 60		44–59	31–43			≤ 30
24–59 mo	≥ 62		46–61	32–44			≤ 31
60–143 mo	≥ 65		49–64	36–48			≤ 35
≥ 144 mo	≥ 67		52–66	38–51			≤ 37
Renal							
Creatinine (μmoL/L)							
0 to < 1 mo	≤ 69		≥ 70				
1–11 mo	≤ 22		≥ 23				
12–23 mo	≤ 34		≥ 35				
24–59 mo	≤ 50		≥ 51				
60–143 mo	≤ 58		≥ 59				
≥ 144 mo	≤ 92		≥ 93				
Respiratory[d]							
Pao_2 (mm Hg)/Fio_2	≥ 61		≤ 60				
$Paco_2$ (mm Hg)	≤ 58	59–94		≥ 95			
Invasive ventilation	No			Yes			
Hematologic							
WBC count (× 10^9/L)	> 2		≤ 2				
Platelets (× 10^9/L)	≥ 142	77–141	≤ 76				

All variables must be collected, but measurements can be done only if justified by the patient's clinical status. If a variable is not measured, it should be considered normal. If a variable is measured more than once in 24 hr, the worst value is used in calculating the score. Fio_2: fraction of inspired oxygen.

Neurologic dysfunction: Glasgow Coma Score: use the lowest value. If the patient is sedated, record the estimated Glasgow Coma Score before sedation. Assess only patients with known or suspected acute central nervous system disease. Pupillary reactions: nonreactive pupils must be > 3 mm. Do not assess after iatrogenic pupillary dilatation.

Cardiovascular dysfunction: Heart rate and mean arterial pressure: do not assess during crying or iatrogenic agitation.

Respiratory dysfunction: Pao_2: use arterial measurement only. Pao_2/Fio_2 ratio is considered normal in children with cyanotic heart disease. $Paco_2$ can be measured from arterial, capillary, or venous samples. Invasive ventilation: the use of mask ventilation is not considered invasive ventilation.

Logit (mortality) = −6.61 + 0.47 × PELOD-2 score.

Probability of death = 1/(1 + exp [−logit(mortality)]).

CRITICAL CARE MEDICINE

Leteurtre, Stéphane; Duhamel, Alain; Salleron, Julia; Grandbastien, Bruno; Lacroix, Jacques; Leclerc, Francis; on behalf of the Groupe Francophone de Réanimation et d'Urgences Pédiatriques (GFRUP); Critical Care Medicine41(7):1761-1773, July 2013. doi: 10.1097/CCM.0b013e31828a2bbd

From *Pediatric Critical Care Triage Algorithm* by Northwest Healthcare Response Network, 2020(https://nwhrn.org/wp-content/uploads/2020/03/Scarce_Resource_Management_and_Crisis_Standards_of_Care_Overview_and_Materials-2020-3-16.pdf). In the public domain.

i. Online Scoring Calculator

European Society of Paediatric and Neonatal Intensive Care:

https://espnic-online.org/Education/Professional-Resources/Paediatric-Logistic-Organ- Dysfunction-2-Score-Calculator

B. SOFA

	Score				
	0	1	2	3	4
Respiratory system					
PaO_2/FiO_2 (mmHg)	≥400	<400	<300	<200 with respiratory support	<100 with respiratory support
Hepatic system					
Bilirubin (mg/dL)	<1.2	1.2–1.9	2.0–5.9	6.0–11.9	>12.0
Cardiovascular system					
	MAP ≥70 mmHg	MAP <70 mmHg	Dopamine <5 or dobutamine (any dose)[a]	Dopamine 5.1–15 or epinephrine ≤0.1 or norepinephrine ≤0.1[a]	Dopamine >15 or epinephrine >0.1 or norepinephrine >0.1[a]
Coagulation					
Platelets $\times 10^3/\mu L$	≥150	<150	<100	<50	<20
Central nervous system					
Glasgow coma scale	15	13–14	10–12	6–9	<6
Renal system					
Creatinine (mg/dL)	<1.2	1.2–1.9	2.0–3.4	3.5–4.9	>5.0
Urine output (mL/d)				<500	<200

Notes: [a]All catecholamine doses represent μg/kg/min. Organ dysfunction is identified as an increase in the SOFA score of ≥2 points. In patients with not known preexisting organ dysfunction, the baseline SOFA score is assumed to be zero. *Intensive Care Med*. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure. On behalf of the Working Group on Sepsis-Related Problems of the European Society of Intensive Care Medicine. 22(7), 1996, 707–710, Vincent JL, Moreno R, Takala J, et al. With permission of Springer.[17]
Abbreviations: PaO_2, partial pressure of oxygen; FiO_2, fraction of inspired oxygen; MAP, mean arterial pressure.

Nunez Lopez, Omar & Cambiaso-Daniel, Janos & Branski, Ludwik & Norbury, William & Herndon, David. (2017). Predicting and managing sepsis in burn patients: Current perspectives. Therapeutics and Clinical Risk Management. Volume 13. 1107-1117. doi: 10.2147/TCRM.S119938.